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# USSR Report

CHEMISTRY

No. 65



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6 November 1979

## USSR REPORT

## CHEMISTRY

No. 65

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USSR

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## THEORY OF THE PHENOMENON OF TURBULENT MIGRATION OF AEROSOL PARTICLES

Moscow KOLLOIDNYY ZHURNAL in Russian No 2, 1979 pp 250-257 manuscript received 30 Dec 77

MEDNIKOV, YE. P., Moscow, Institute of the Problems of Mechanics, USSR Academy of Sciences

[Abstract] The turbulent flow of an aerosol in a pipe is accompanied by a noteworthy phenomenon--the transverse or rather turbulent migration of the suspended particles in the direction in which the rate of the transverse fluctuations of the flow diminishes, that is, chiefly in the neighborhood of the wall boundary. This results in an increase in particle concentration in the neighborhood of the wall boundary, and in the rebound of the particles from the wall in the event that it is a non-absorbing and non-adhesive wall or, conversely, in the decrease in particle concentration at flow periphery and in deposition of particles on the wall in the event that the wall surface is absorbent (i.e. retains particles). This effect, discovered in an earlier study by the author is now found to apply not only to circular channels but also to the flow of aerosols in rectangular and slotted channels, in the boundary layer near plates and foundations, and even in the atmospheric surface layer. In this connection, a more detailed and broader analytic solution of the problem of transverse migration of particles suspended in a turbulent shear flow of a gas is presented, and the limits of applicability of that solution are formulated. The derived equations are used to analyze the mechanism of the phenomenon of turbulent migration of particles and it is demonstrated that, when considered on the infinitesimal scale, that phenomenon may be interpreted as a chain of periodic free inertial paths traveled by a particle in accord with the pulsations of a medium with an asymmetrical harmonic motion. The presented solution of the problem is a formal mathematical solution which serves to demonstrate the existence of this effect rather than to compute it, in view of the limitations of the analytic solution of the equation of particle motion. A numerical solution of the problem would be more workable, but still requires further investigation. Figures 2; references 17: 14 Russian, 3 Western.

USSR

UDC 543.544:547.68

CHROMATOGRAPHIC METHODS OF DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE ENVIRONMENT

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian No 3, Mar 79 pp 577-590  
manuscript received 26 Dec 77

KOROL', A. N., LYSYUK, L. S., Institute of Physical Chemistry, Ukrainian Academy of Sciences, Kiev

[Abstract] The analytic problem of determination of polycyclic aromatic hydrocarbons [PAH] in the environment has two main, closely related, aspects: hygienic evaluation of the quality of the environment and determination of the source of pollution with carcinogenic PAH. Whereas hygienic evaluation of the environment requires determination of individual components, location of sources of pollution may best be done using profiled chromatograms, on which the relationships of the individual peaks produce characteristic profiles for the exhaust gases of motor vehicles, emissions of industrial enterprises, the stack gases of coke ovens, etc. In this case, the components of the mixture need not be individually identified, the chromatograms serving as "signatures" of pollution sources. This literature review discusses the methods of liquid, gas, thin-layer and paper chromatography as they have been applied to the problem, particularly, of determination of 3, 4-benzpyrene and other isomers PAH. References 150: 4 Russian, 146 Western.

USSR

UDC 543.544:543.8

DETERMINATION OF ALKYL- AND ARYLPHOSPHITES BY THIN-LAYER CHROMATOGRAPHY AND OXIDIMETRY

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian No 3, Mar 79 pp 569-571  
manuscript received 27 Jan 78

MIKHAILOVA, N. N., TOLSTOPYATOVA, N. P., EGIDIS, F. M., Scientific Research Institute of Chemicals for Polymer Materials, Tambov

[Abstract] Thin-layer chromatography and oxidimetry are used to determine alkyl- and arylphosphites. The phosphites studied were obtained by the interaction of phenyl, 2-ethyl hexanol and alkyl-phenyls with phosphorus trichloride. Chromatographic separation of the phosphites was performed on thin layers of aluminum oxide and on Silufol plates (CSSR). Clear separation was achieved with proper selection of the mobile phase. The

content of phosphoric acid esters in the phosphites and the composition of the phosphites can thus be determined by thin-layer chromatography and titrimetric oxidation of the esters with hydrogen peroxide in acetic acid. Figure 1; references 5: 4 Russian, 1 Western.

USSR

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DETERMINATION OF TRACES OF AROMATIC HYDROCARBONS IN AIR BY THE EQUILIBRIUM CONCENTRATION METHOD WITH VARIABLE VALUES OF THE COEFFICIENTS OF DISTRIBUTION

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian No 3, Mar 79 pp 557-563  
manuscript received 14 Feb 78

TSIBUL'SKAYA, I. A., VITENBERG, A. G., IOFFE, B. V., Leningrad State University imeni A. A. Zhdanov

[Abstract] The essence of the method of equilibrium concentration of organic trace impurities from gases into volatile liquids lies in the saturation of a pure liquid with the gas being studied to a stable equilibrium distribution and subsequent gas chromatographic determination of the concentration of the substance being analyzed in the liquid. This work studies the possibility of determination of aromatic hydrocarbons in moist air by this method when the distribution coefficients of the trace impurities may change during the process of sampling. It is shown that the method can be used under these conditions with acetic acid as the volatile solvent. This makes possible the use of this method for determination of trace impurities in gases, by saturation of the acetic acid, gas chromatographic determination of the concentration of impurities in the liquid and determination of the concentration of acetic acid by titration with alkali. Figures 3; references 11: 8 Russian, 3 Western.

USSR

UDC 542.61:547.551.43

# EXTRACTION OF PHENYLUREA HERBICIDES FROM AQUATIC MEDIA BY ORGANIC SOLVENTS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian No 3, Mar 79 pp 554-556  
manuscript received 1 Dec 77

BAZHENOVA, L. N. KIRICHENKO, V. YE., PASHKEVICH, K. I., Institute of Chemistry, Urals Scientific Center, USSR Academy of Sciences, Sverdlovsk

[Abstract] The authors determined the constants of distribution of a number of phenylurea herbicides between water and the organic solvents most frequently used for extraction of phenylurea (hexane, benzene and chloroform). The results produced allow quantitative description of the extraction of phenylurea by these solvents and estimation of the extraction capacity of aliphatic and aromatic hydrocarbons as well as their halogen-substituted derivatives. Chloroform was found to have the greatest extraction capacity, followed by benzene and hexane. The presence of large quantities of neutral salts significantly increases the distribution coefficients. References 6: 5 Russian, 1 Western.

USSR

UDC 614.7-07:389.6

# STANDARDIZATION AND CONTROL OF MAXIMUM PERMISSIBLE CONCENTRATIONS AS A METROLOGICAL TASK

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 pp 50-54 manuscript received 3 Apr 78

SHAYEVICH, A. B. and AMJSINA, KH. M., Ural Wood Technology Institute, Sverdlovsk

[Abstract] This is a discussion of familiar problems involved in establishing standard maximum permissible concentrations (MPCs) of toxic substances and of assays used to monitor concentrations of such substances in the environment. Practical consideration is given to the precision of procedures involved, and establishment of a specific numerical value for the MPCs, e.g., the number of significant figures to be used, as dictated by how accurate the innate error of the analytical procedure can be. Attention is directed to the need for attestation of each analytical procedure, devising ways to control the accuracy of results of the procedure, calibration of apparatus, systematic comparison of the same tests done at numerous laboratories, standardization of equipment and qualitative

composition of glassware and other reagent containers, use of identical directions for laboratory procedures, and the like. Figure 1; references 3: 2 Russian, 1 Western.

USSR

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#### ASSAY OF CYANOX BY THIN-LAYER CHROMATOGRAPHY

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 pp 47-48 manuscript received 25 Aug 78

BAYDA, T. A., Candidate of Biological Sciences, Kazakh Scientific Research Institute for Plant Protection, Alma-Ata

[Abstract] Cyanox is an organophosphorus insecticide, o,o dimethyl-o-4-cyanophenyl thiophosphate issued by Sumitomo (Japan) as a 50% emulsion. It has been successfully used in the Kazakh SSR against grasshoppers. In the piedmont area of Zailiyskiy Ala-Tau its massive use could affect animal pastures and production. In the absence of a familiar method, a thin-layer chromatographic assay on silica gel is suggested. The cyanox was extracted with a fat solvent;  $\text{CHCl}_3$  was found most suitable; the best mobile solvent was a mixture 2:1 of hexane-acetone. Palladium chloride in HCl was used to develop the spots. Details of the assay (in a green mass) are presented. The method is described as simple and suitable for wide use in practice. No references.

USSR

UDC 614.72+614.777/-074:632.95

#### METHOD FOR ASSAYING ENAMINE IN AIR AND WATER

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 p 46 manuscript received 26 May 78

PILENKOVA, I. I., Candidate of Chemical Sciences, FAT'YANOVA, A. D., ZEMCHENKOVA, G. K. and YURKOVA, R. G., Ufa Branch of the All-Union Scientific Research Institute of Plant Protection

[Abstract] Enamine is 2-(3-cyclohexylureido)-cyclopentene-1,2-carboxybutane-1 and is an intermediate in the synthesis of the herbicide hexilur. In the absence of a standard method for assaying enamine in

air and water, a thin-layer chromatographic method has been devised. A "silufol" (Czech made) sorbent was used, mobile solvent hexane-acetone. N-halogenation with iodine was used to develop the enamine. Details of the assay procedure are given. Sensitivity was  $0.01 \text{ mg/m}^3$  (air) and  $0.005 \text{ mg/l}$  (water). No references.

USSR

UDC 613.632.4:615.212.7]-074:543.544

DETERMINATION OF FLUOROTHANE IN AIR BY THE METHOD OF GAS-LIQUID CHROMATOGRAPHY

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 79 pp 58-59 manuscript received 17 Jul 78

KRECHKOVSKIY, YE. A., Candidate of Medical Sciences, and ANISIMOVA, I. G., Kiev Medical Institute

[Abstract] Fluorothane (1,1,1-trifluoro-2-chloro-2-bromoethane) is used for inhalation narcosis in anesthesiology. The authors developed a method for determining this gas in air based on gas-liquid chromatography using the Soviet Tsvet-104 chromatograph and Soviet polyethylene glycol-300 applied on chromatone N. The gas carrier flows at a rate of  $120 \text{ ml/min}$ , and tape transport speed is  $240 \text{ mm/hour}$  in the chart recorder. The working scale of the electrometer is  $100 \cdot 10^{-12} \text{ A}$ . Diethyl ether does not interfere with the recording process. The minimum detectable amount of fluorothane is  $0.5 \text{ ng}$ . Sensitivity is  $0.5 \text{ mg/m}^3$ . Tests showed that the concentration of fluorothane in the working areas of hospitals may reach  $40\text{-}690 \text{ mg/m}^3$ . References 3 (Russian).

[77-6610]

USSR

UDC 614.777:615.285.7]-074+628.191:615.285.7]:543.544

DETERMINATION OF RESIDUAL AMOUNTS OF SUFFIKS IN WATER BY GAS-LIQUID CHROMATOGRAPHY

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 79 pp 57-58 manuscript received 25 Jul 78

CHMIL', V. D., PILENKOVA, I. I., FAT'YANOVA, A. D. and ZOROVA, A. I., All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev

[Abstract] Suffiks (karakhol) -- ethyl ester of N-benzoyl-N-(3,4-dichlorophenyl) alanine -- is used in agriculture as a herbicide against wild oats in grain fields. It is a white crystal with melting point of 70-71°C, practically insoluble in water, and readily soluble in organic solvents such as ethanol, methanol, acetone, carbon tetrachloride and toluene. In this research a method was developed for determining residual traces of suffiks in water by gas-liquid chromatography. The method is based on using the Soviet Tsvet-106 gas chromatograph. The herbicide is separated from the solvent in a glass tube filled with chromatone N washed with acid and silanated with dimethyldichlorosilane with 5% dimethyl silicone SE-30. The gas stream carrier is nitrogen. The electrometer scale is  $20 \cdot 10^{-12}A$ , and the chart recorder moves at a rate of 240 mm/hour. The minimum detectable amount of suffiks is 1 ng, and the linear dynamic range of detection is at least 60 ng. Sensitivity is 0.002 mg/l. References 2 (Russian).

[77-6610]

USSR

UDC 614.777+628.312]:615.277.4

CHROMATOGRAPHIC DETECTION OF VOLATILE N-NITROSAMINES IN NATURAL WATER AND SEWAGE

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 79 pp 53-57 manuscript received 31 May 78

KOSTENKO, L. D. and KOSTENKO, V. G., Scientific Research Institute of Oncology imeni Professor N. N. Petrov, Ministry of Health USSR, All-Union Scientific Research Institute of Hydrolysis of Plant Materials, Leningrad

[Abstract] An investigation was made of the behavior of dimethyl, diethyl, di-n-propyl and di-n-butyl nitrosamines under various conditions of chromatographic determination to find the best versions of chromatographic

separation of these carcinogens. The results of the analysis show that reliable determination of volatile nitrosamines requires simultaneous use of at least two versions of chromatographic determination with different principles of separation (gas-liquid and liquid chromatography with reversed phases) and detection (flame ionization detector and spectrophotometric determination). It is shown that the water in the Neva River contains less than 5  $\mu\text{g/l}$  of the four alkyl nitrosamines studied, while the yeast water from Leningrad Hydrolysis Plant contains more than 20  $\mu\text{g/l}$ . References 15: 5 Russian, 10 Western.

[77-6610]

USSR

UDC 614.72:631.842.4]-074

#### DETERMINATION OF AMMONIUM NITRATE IN ATMOSPHERIC AIR

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 79 pp 52-53 manuscript received 27 Jul 78

YULDASHEV, T. YU., Candidate of Medical Sciences, Uzbek Scientific Research Institute of Sanitation, Hygiene and Occupational Disease, Tashkent

[Abstract] A simplified sensitive method was developed for determining the content of ammonium nitrate in atmospheric air based on a photo-colorimetric technique in which a yellow-brown compound (hydroxydimercury ammonium) is formed when an ammonium ion reacts with Nessler's reagent. The sensitivity of the method is 0.01  $\text{mg/m}^3$ . The procedure can be used to determine ammonium salts in water. The air sample is taken by aspiration through an AFA filter in a cartridge. The method eliminates the use of alcohol or acids, the extraction being done with distilled water. Reference 1 (Russian).

[77-6610]

## GAS-CHROMATOGRAPHIC DETERMINATION OF EPICHLOROHYDRIN IN AIR

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 79 pp 50-52 manuscript received 3 Aug 78

KAMALOV, R. S., Uzbek Scientific Research Institute of Sanitation, Hygiene and Occupational Illnesses, Tashkent

[Abstract] A method of gas chromatography was developed for determining epichlorohydrin in the presence of other volatile compounds released into the air when producing and using furan epoxy resins. The method utilizes the Soviet Tsvet-5 gas chromatograph. Complete separation of solvent and epichlorohydrin is done in a glass column 1 m long and 0.35 cm in diameter filled with silanated chromatore N with liquid phase SE in an amount of 30.5% by weight of the carrier. The gas stream carrier flows at a rate of 3 liters per hour, and the chart recorder moves at a rate of 360 mm per hour. The amplification current on the electrometer is  $0.25 \cdot 10^{-10} \text{ A}$ . Air specimens are collected on activated charcoal in a corrugated tube. The epichlorohydrin is desorbed from the charcoal by diethyl ether. The error of determination is 3.5-4%. Experiments showed that the presence of furfural, furfuryl alcohol and acetone in concentrations of up to 1000 times the epichlorohydrin concentration do not interfere with determination. The air specimens can be kept in the collectors for up to ten days. Minimum detectable amount of epichlorohydrin is 0.001  $\mu\text{g}$ , and sensitivity of determination is 0.1  $\text{mg}/\text{m}^3$ . The method was checked under laboratory and production conditions on FAED-8, FAED-10 and FAED-20 furan epoxy resins. References 2 (Russian).

[77-6610]

USSR

UDC 547+577

ADSORPTION IMMOBILIZATION OF ALCOHOL DEHYDROGENASE ON HYDROPHOBIC CARRIERS

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 2 KHIMIYA in Russian  
No 2, Mar/Apr 79 pp 114-117 manuscript received 23 Mar 78

MITROFANOVA, A. N., MIKEL'SONE, Z. V., POLTORAK, O. M., AREN, A. K.,  
Department of Physical Chemistry

[Abstract] The immobilization of alcohol dehydrogenase on the surface of silica gel modified by the lipids cholesterol and lecithin was studied in order to determine the significance of the surface to the enzymatic activity of ADH. The catalytic activity of the enzyme was found to be closely related to its conformation; even slight conformation changes cause significant changes in enzymatic activity. The changes in kinetic parameters upon immobilization and the nature of the pH variation, as well as specific catalytic activity as a function of type of carrier used and degree of coverage with the enzyme, indicate that when the protein is adsorbed on a solid adsorbant, rather significant changes occur in the structure of the protein globules. Figures 4; references 8 (Russian).

USSR

UDC 547+577

ADSORPTION IMMOBILIZATION OF ALCOHOL DEHYDROGENASE ON SILICA GEL AND SILICA GEL MODIFIED WITH ALBUMIN

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 2 KHIMIYA in Russian  
No 2, Mar/Apr 79 pp 109-113 manuscript received 23 Mar 78

MIKEL'SONE, Z. V., MITROFANOVA, A. N., POLTORAK, O. M., AREN, A. K.,  
Department of Physical Chemistry

[Abstract] A study was made of the properties of alcohol dehydrogenase in concentrated layers at an interphacial boundary. In the experiments, the kinetics of alcohol to aldehyde conversion were measured spectrophotometrically on a carrier consisting of wide-pore silica gel. The silica gel monolayer was modified with serum albumin adsorbed from aqueous solutions. It was demonstrated that the mechanisms of association of alcohol dehydrogenase, immobilized on surfaces of silica gel and silica gel with albumin, differ markedly, apparently a result of the difference in bonding of protein globules to the two types of surfaces. Figures 4; references 9: 5 Russian, 4 Western.

## SYNTHETIC CHEMICALS FROM CELLULOSE VIA IMMOBILIZED ENZYMES

Moscow KRASNAYA ZVEZDA in Russian 14 Jun 79 p 4

[Article by V. Batrakov: "According to Nature's 'Patents'"]

[Text] "New industrial processes must be developed, using highly efficient catalytic systems, which would provide for an increase in productivity of the main technological equipment...." ("Main Directions of Development of the National Economy of the USSR in 1976-1980").

We seldom think about the fact that there is a real "tempest" of chemical conversions in our body, which does not stop for even an instant. We think even less about the fact that all biochemical reactions do not take place haphazardly, but they are strictly coordinated. Who then is the "director" who controls these complex processes so skillfully? It turns out that special protein molecules--enzymes--are to be credited for this.

Enzymes are remarkable in that they are capable of accelerating by many millions of times chemical processes, on which metabolism is based, at room temperature and atmospheric pressure. Virtually all biochemical reactions are speeded up by a special enzyme for each, and they proceed in such a way that virtually no unneeded compounds are formed as a result thereof. In other words, enzyme molecules, like craftsmen with the highest qualifications, work rapidly and without waste.

What if these miracle enzymes were to be used in the chemical industry? With this objective in mind, chemists encountered some difficulties. In the first place, the special protein molecules are extremely delicate, they are rapidly destroyed and lose their activity outside a living cell. In the second place, enzymes can function only when they are dissolved in water, and it is impossible to separate them from the product after the process is terminated. This means that there is only one solution: to take some substance that is insoluble in water, let us say porous glass, and to "attach" ["stitch, staple"] enzyme molecules to its superficial groups of atoms. Now the enzyme will no longer be washed off with a solvent and will not be mixed with the product. It will become more stable, but will not lose its inherent activity and specificity.

Chemists all over the world are working intensively on development of expressly such catalytic systems. Extensive research of this kind is also being pursued in our country. Already, enzymes bound with inert carriers are being used for the synthesis of some expensive drugs, for example, prednisolone. But there is also another route: to use catalysts obtained from the "patents" of living nature.

First of all, one can use synthetic models as catalysts, rather than enzymes, i.e., one can have the properties of industrial catalysts as similar as possible to those of natural enzymes. But there is also another route which holds much promise.

What serves as raw material for the industry of modern organic synthesis? First of all, this refers to petroleum, coal and natural gas, which contain various carbon and hydrogen compounds. The entire diversity of substances included in the broad term "synthetics" is developed by means of chemical conversions from these raw materials. But, hydrocarbons and products of processing thereof can usually not be "handled" by enzymes. Carbohydrates are another matter; they consist of carbon, hydrogen and oxygen--sugar, starch and cellulose.... For example, by means of enzymatic reactions, one can obtain various alcohols, furfural, isoprene, amino acids, vitamins and many other compounds from the carbohydrate, glucose. In a word, glucose alone is theoretically capable of replacing petroleum, as well as coal and gas.

But where are we to get glucose? It can also be obtained enzymatically, from cellulose, which is the main building material of green plants. The stock of cellulose can be replenished with each new harvest of plants that are particularly rich in this substance; this means that, at the same time, another problem that is already alarming mankind will be solved, the problem of depleting the stock of nonrenewable natural raw material.

There is more: The chemical industry, for which cellulose serves as raw material and all processes are based on the use of enzymes, will no longer be detrimental to the environment, since it will not produce any deleterious waste.

Thus, by using the technology created by living nature in the course of hundreds of millions of years of evolution, one can solve an entire set of problems at once.

[101-10,657]

10657

CSO: 1841

USSR

UDC 541.126+534.222.2

## INITIATION ENERGY OF DIVERGENT WAVES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 247 No 4, 1979 pp 887-889  
manuscript received 20 Feb 79

TROSHIN, K. YA., Institute of Chemical Physics, USSR Academy of Sciences,  
presented by Academician N. M. Emanuel on 15 Feb 79

[Abstract] The energy for initiating divergent spherical or cylindrical detonation is estimated for an ideal gas as the combustible medium. It is assumed to be at rest in the unperturbed state; energy is assumed to be released instantaneously at a point or at a thin, infinitely long axis. Only energy per unit length is appropriate for discussion of the latter case. The rapid release of energy in a detonating gas overcompresses the divergent detonation waves. If the initiator energy exceeds some critical value, these waves, on weakening, attain the Chapman-Jouguet detonation rates, then continue to propagate in a self-sustaining regime. An expression is derived for this minimum energy as a function of the specific energy release, density, pressure of the unperturbed gas and total energy of the detonation products. The calculated values of the energy (in joules) for  $H_2$  as the combustible medium versus the percentage of  $H_2$  are exceeded by the experimental values by a factor of two or three. Evidently accounting for this discrepancy is the assumption of instantaneous release of energy at a point. Actually, real initiation sources have finite dimensions and a finite rate of energy release, strongly affecting the formation and subsequent damping of the divergent overcompressed detonation wave. Figures 1; references 7: 6 Russian, 1 Western.

[85-10123]

USSR

UDC 534.222.2

## MINIMUM INITIATION ENERGY FOR SPHERICAL GAS DETONATION OF SOME HYDROGEN MIXTURES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245 No 3, 1979 pp 623-626  
manuscript received 4 Dec 78

BOKHON, YU. A. and SHULENIN, YU. V., USSR Academy of Sciences Institute of  
Chemical Physics, Moscow

[Abstract] It was established in an earlier study that the minimal energy,  $E$ , required for the initiation of stationary spherical gas detonation is

proportional to the cube of the width of the chemical reaction zone,  $\lambda$ , in a specific two-front detonation model. It was later determined that the gas detonation front remote from boundaries represents a multi-front cellular system of transverse waves with combustion of the mixture at points of their collision. The cellular structure of the detonation front is distinctly recorded on the smoked walls of the detonation tube in the form of diamond-shaped trace impressions. It was further shown that the longitudinal dimension,  $b$ , of the detonation cell is approximately equal to  $\lambda$ . In this paper results are presented of an experimental study of the interrelationship between  $b$  and  $E$ , using the example of oxygen mixtures of hydrogen and of a stoichiometric hydrogen-air mixture. Theoretical calculation of the magnitude of  $E$  without taking into account the real structure of the gas detonation front results in considerable disagreement with experimental values. An experimental determination was made of the minimal energy,  $E$ , for the initiation of spherical detonation waves in hydrogen-oxygen mixtures which were close to limiting in terms of composition. Detonation was initiated with explosive charges (mainly hexogen) of spherical or cylindrical shape, by means of an electric detonator. Measurements were made of the rate of propagation,  $D$ , of spherical detonation waves, by means of a high-speed photographic recorder, and of the mean longitudinal dimensions of detonation cells,  $b$ , by the trace method. A sketch is shown of the relative position of the explosive charge, the smoked glass plate, and the direction for photographic recording. Thin-walled rubber balloons were used as gas discharge shells, filled with the explosive mixture to the degree of transparency required for photographic recording. A curve is shown, representing the results of measurements of rates of spherical detonation waves,  $D$ , and of the mean longitudinal dimensions of detonation cells,  $b$ , as a function of the composition of hydrogen-oxygen mixtures. The results of a theoretical estimate of detonation rates are plotted on this graph for comparison. The generalization of results obtained for stoichiometry, for mixtures differing from stoichiometric in terms of composition, and also for a hydrogen-air stoichiometric mixture made it possible to establish the following approximate rule:  $E \approx E_{st} [stoichiometric] \cdot (b/b_{st})^3 \approx 17b^3$ . The results of calculation by this equation are plotted against experimental data. Good agreement is found. Figures 3; references 10: 9 Russian, 1 Western.

## OXIDATION OF HYDROGEN AT HIGH PRESSURES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245 No 3, 1979 pp 631-635 manuscript received 17 Oct 78

GONTKOVSKAYA, V. T., MERZHANOV, A. G., OZERKOVSKAYA, N. I. and PEREGUDOV, A. N., USSR Academy of Sciences Institute of Chemical Physics Division, Chernogolovka, Moscow Oblast

[Abstract] Methods of mathematical modeling are employed for the purpose of investigating the high-pressure region in the oxidation of hydrogen and for investigation of the feasibility of direct synthesis of hydrogen peroxide. Because of procedural difficulties, there are practically no experimental studies of the oxidation of hydrogen at high pressures. A mathematical method, suggested earlier by the authors, for investigating the real mechanism of complex reactions is used, making it possible to isolate by means of a computer the minimal number of governing elementary stages and thereby to simplify considerably analysis of the kinetic behavior of the chemical system. The values of practically all elementary constants are known for the hydrogen oxidation reaction. Seven regions with a different set of leading elementary reactions have been isolated in a plane with pressure-vs.-temperature coordinates. The region of the plane considered here is shown and a list is given of the reactions making up the minimal reaction mechanism. The mechanism according to which the reaction proceeds in the low-pressure region is shown for comparison for the purpose of stressing distinctive features of the process in the high-pressure region. It is shown that at high pressures the oxidation of hydrogen is a reaction with confluent chain branching. The system of equations describing the process contains minor parameters making it possible to simplify it. The system of seven kinetic equations is reduced to two for  $[H_2O]$  and  $[H_2O_2]$ . Accumulation of the product proceeds linearly over time at a specific rate, and the rate of formation of  $H_2O$  begins to increase and reaches a maximum at the instant the  $[H_2O_2]$  maximum is reached. The system is made quasi-stationary for peroxide and is reduced to a single differential equation for  $[H_2O]$ . A heat balance equation is introduced to discuss the question of thermal shock. With  $\alpha(S/V) < [\alpha(S/V)]_{kr}$  [critical] a thermal shock takes place, where  $\alpha$  is the heat transfer coefficient and  $S$  and  $V$  are the surface and volume respectively of the reaction vessel. The  $[H_2O_2]$  maximum is reached at the end of the process, after which the peroxide instantaneously breaks down and heating is very high. In the high-pressure region there is no chain limit, but there is a thermal limit. Thermal limits computed on a computer are shown. Figures 4; references 8: 7 Russian, 1 Western.

USSR

UDC 628.334.152:(547.412.4+678.743.22

HYGIENIC EVALUATION OF FIRE DISPOSAL OF WASTES FROM PRODUCTION OF DI-CHLOROETHANE AND VINYLCHLORIDE

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 pp 61-63 manuscript received 4 May 78

LUBYANSKIY, M. L., LEVINA, M. M., GRONBERG, Candidate of Chemical Sciences and MIKHNO, V. B., Gorkiy Scientific Research Institute of Labor Hygiene and Occupational Diseases, RSFSR Ministry of Health

[Abstract] Dichloroethane and vinyl chloride wastes from plants producing chlorinated hydrocarbons, discharged in liquid form, were collected in cisterns and subsequently burned in 1150-1250°C ovens. The materials so produced, HCl and water vapors, were cooled in a column and passed through an absorber. The HCl is eventually picked up in hydrochloric acid bath and in water, and recycled in the manufacturing process. The process is hygienically desirable and has been found to protect the environmental zones surrounding chlorinated hydrocarbon manufacturing plants from levels of chlorine and HCl which have otherwise exceeded maximum permissible levels. Use of slaked lime as an absorbent would also be feasible and yield calcium hydrochlorite as a useful commercial raw material. Reference 1 (Russian).

USSR

UDC 613.632:615.285.7/:63(049.2)

COMMENTS ON THE ARTICLE BY CAND. MED. SCI. A. YA. YAKUBOVA, "ESTABLISHMENT OF ZONES OF DEGREE OF 'PESTICIDE DANGER' AND THE LEVELS OF MORBIDITY IN DIFFERENT ZONES"

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 pp 55-57 manuscript received 10 May 78

TKACH, L. I., Candidate of Medical Sciences, All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev

[Abstract] The original title article appeared in GIG. I SAN., No 5, 1977, p 73, and discussed the effect of pesticides in combination with high temperatures as a factor in population morbidity. The author of that article is taken to task for commission of methodological errors in the handling of his data. Tkach's group have similar interests in this area of study; he quotes authorities for proper handling of data. Best insight

to morbidity would come from knowledge of visits for medical help, prophylactic examinations, and functional tests, supplemented by appropriate questionnaires completed during questioning of patients. A number of indices of health must be considered--morbidity, physical development, non-specific indices of functional bodily state--following guidelines prepared by the All-Union Scientific Research Institute of Social Hygiene and Organization of Health imeni Semashko and, for children, the Scientific Research Institute of Hygiene of Children and Adolescents, USSR Ministry of Health. Any association of status of health and environmental contamination is logically revealed by longitudinal epidemiological studies under actual conditions.

USSR

UDC 628.543 : 628.3

#### ELECTROCHEMICAL CLEANING OF DISCHARGE WATER FROM THE PRODUCTION OF DIRECT AND ACTIVE DYES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 52 No 3, 1979 pp 597-601 manuscript received 1 Nov 77

ENDYUS'KIN, P. N., SELEZENKIN, S. V., DYUMAYEV, K. M. and UL'TRIVANOVA, M. A., Scientific Research Institute of Organic Intermediate Products and Dyes

[Abstract] A description is given of a laboratory unit which demonstrates that it is possible to clean discharge waters from the production of direct and active dyes by employing sodium chloride, by subjecting discharge water to single-stage electrochemical treatment, making possible simplification of the technology and lowering of energy costs. In the production of direct and active dyes, discharge water is formed, containing 2 to 20 g/l of dyes and byproducts and 150 to 250 g/l of sodium chloride. Methods of cleaning discharge water currently used do not utilize the sodium chloride, and thus do not prevent the pollution of waterways, are complex, and do not make it possible to utilize valuable byproducts. In the laboratory unit designed, discharge water or the sodium chloride solution are continuously fed into the anode space of a diaphragm-type electrolyzer whose cathode is made out of an iron grid and whose anode is made out of graphite, with the distance between the cathode and anode equaling 1 cm. The diaphragm consists of a sheet of acid- and alkali-resistant asbestos applied to the anode. Electrolysis is performed with a current density of  $0.08 \text{ A/cm}^2$  and the temperature of the anolyte is  $90^\circ\text{C}$ . The unit current density equals 15 A/l and the voltage is 3.3 to 3.4 V. As an experiment, fed to the electrolyzer were discharges of direct and active dyes, a mixture of discharges and sodium chloride solution, and for comparison a solution of sodium chloride. Analyses were made of the discharge, brine,

electrolytic alkali, gaseous byproducts, and of the content of nitrogen trichloride in the chlorine. Subjected to cleaning were a mixture of discharges from two brands of direct green light-resistant dyes and a mixture of 10 brands of active dyes based on cyanuric chloride. The discharge water or solutions prepared for electrolysis contained 310 g/l of sodium chloride, not more than 0.005 g/l of calcium ions, 0.001 g/l of magnesium ions and about 5 g/l of sulfates. The pH of the solutions normally equaled 10 to 11, but special experiments were conducted in which alkali was added to the discharge water to bring the pH of the anolyte within the range of 5 to 7. The electrolyzer operated continuously for a whole month. During the electrolysis of a solution of sodium chloride in the presence of organic compounds, in the anode chamber chlorine is formed and organic substances are oxidized to carbon dioxide, water and molecular nitrogen. When the pH of the anolyte is brought below 3, organic substances are also chlorinated. It was found that it is necessary to bring the pH of the anolyte within the range of 3 to 7. This is accomplished by diluting the discharge water with a solution of sodium chloride to bring the chemical oxygen requirement to 2 g/l, or by adding alkali to the discharge water for the purpose of neutralizing the hydrogen chloride formed in the dissolving of chlorine in the water and in the oxidation of organic substances by active chlorine, resulting in increased acidity. Usable byproducts formed are caustic soda and liquid chlorine. Thus, by diluting the discharge water with a 20-fold solution of sodium chloride or by adding alkali for the purpose of maintaining the pH in the anolyte within the range of 3 to 7, a simplified and less expensive method of cleaning the discharge water is implemented. Figures 1; references 5 (Russian).

USSR

UDC 678.02:628.543

#### OPTIMIZATION OF WATER CONSUMPTION IN THE RINSING OF RESINS AND SEMI-FINISHED PRODUCTS

Moscow PLASTICHESKIYE MASSY in Russian No 4, 1979 pp 48-50 manuscript received 18 Feb 77

KARPENKO, L. A., KARPENKO, I. A. and SHMIDT, T. YA.

[Abstract] Formulas for reducing to a minimum the amount of water used to rinse resins and semifinished products in the production of plastics, synthetic fibers, and other materials are presented. These formulas were verified while investigating the process of the water-rinsing of dialkylphthalate (DAF-68) obtained on an acid ( $H_2SO_4$ ) catalyst, with the rinsing intended to eliminate the alkalis and salts forming during the stage of

the neutralization of the acid ingredients of the plasticizing agent by a solution of caustic soda. The experimental range of values of the optimal rinsing modulus were found to correspond to their theoretically derived counterparts. It was established that the optimal conditions for rinsing resins to remove from them insoluble impurities are as follows: coefficient of dilution  $M_{opt} = 2.71$ ; number of rinsings  $n_{opt} = 2.303 \Delta pH$ ; and optimal (in terms of water consumption) rinsing modulus  $q_{opt} = 3.95W \Delta pH$ , where  $W$  is constant moisture content of the product. Figures 2; references 4 (Russian).

[93-1386]

## Fertilizers

### FERTILIZER PLANT AT SOLIGORSK--PROBLEMS INVOLVED IN COMPLETION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Aug 79 p 3

[Article by V. Protasenya: "Allied Worker, Keep Up the Rates."]

[Text] The Beloruskaliy Production Association imeni 50-Letiya SSSR supplies the country with over 9 million tons of potassium fertilizers daily. Last year their flow from Soligorsk increased by 1,700,000 tons--the fourth Soligorsk potassium combine, newly put into operation, has this kind of productivity. This year the channel of the flow is expanding even more. The construction and installation workers are preparing to turn over the second section of the plant for operation in December.

Little time is left before it is put into operation. Therefore, the general contractor--Trust No 3 of the Belorussian SSR Ministry of Industrial Construction--is doing everything possible to accelerate the work. The collectives of associated workers are also supporting it, as for example, the brigade of L. Volkov from the Soligorsk Installation Administration of the Minsktekhmontazh Trust. It is one of the active participants in the "workers' relay race." It is fulfilling its own assignments for assembly of the structures considerably ahead of the network schedule, giving its neighbors extra time. There are many such examples. The competition affords the opportunity to perform the construction work at rates close to the planned ones. In seven months the assignment for construction and installation work was overfulfilled by 700,000 rubles, which in total is 53 percent of the year's volume.

If, however, we digress from the figures and look at the actual state of affairs for a number of projects, says I. Ladut'ko, secretary of the party committee of the master contracting trust, then the picture is not so favorable. The buyer and its own ministries and the republic supply organs and the "remote" suppliers place obstacles in front of the finish line for the participants in the competition.

The general contractor, for example, is not at present fully clear on the subject of the underway complex. This is not the only grievance against the main partner in the competition--the buyer. The construction project needs 1,440 tons of so-called nonstandardized equipment, and in 7 months it has received only 875 tons. The existing basic industrial units cannot be completely equipped and assembled on this principle. As far back as June the buyer should have supplied three units of large-scale imported equipment, but only two were obtained. The installation of these has not begun, however, due to the absence of a representative of the installation chief. No one knows the deadline for receiving the third unit.

The ministries of the participants in the competition are not giving them good assistance either. The joint measures of the republic's Ministry of

Industrial Construction and Ministry of Installation and Special Construction Work to ensure putting the capacities into operation. It is specified that the projects be completely equipped with wall panels in August. Repeated appeals of the general contractor to the production-planning administration of the Belorussian SSR Ministry of Industrial Construction, however, requesting that the quotas be allotted in the third quarter, remained fruitless. Without the enclosing structures, the supplying firm does not authorize the beginning of installation of the imported equipment. The Soligorsk construction workers also have serious grievances against the suppliers now who, even according to the resources allotted, are supplying cement very irregularly.

The construction workers hope that the associated workers will understand their anxiety and exert their efforts so that one of the most important fertility factories can provide its product precisely by the planned deadline.

[90-12151]

12151

CSO: 1841

USSR

UDC 633.16:631.84

#### INFLUENCE OF FORMS OF NITROGEN FERTILIZER ON YIELD AND QUALITY OF BARLEY GRAIN

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979 pp 21-22

GAYNULLIN, F. M. and MARKOVSKIY, A. G., Candidate of Agricultural Sciences, Kuybyshev Agricultural Institute

[Abstract] Studies were made on the forest steppe of Central Povolzhe (Kuybyshev Oblast) in 1973-1975 at the Kinel'skaya State Selection Station imeni Academician Konstantinova. The nitrogen fertilizers used (ammonium nitrate, urea formaldehyde, sodium-ammonium sulfate, ammonium chloride and ammonia water) were applied in the spring at 45 kg per hectare. Phosphorus and potassium were applied in the fall. Effects of the various forms of nitrogen fertilizer, mass, and harvest yield, are tabulated. Protein quality of the grain was also assayed by year. All of the nitrogen fertilizers had a favorable influence on the harvest yield of barley, after spring wheat. Ureaformaldehyde had the maximal effect on grain protein, but is not to be favored from an economical point of view.

[70-8586]

USSR

UDC 633.14:631.816:631.84

# AUTUMN AND SPRING LIQUID FERTILIZATION OF WINTER RYE WITH NITROGEN ON SLOPES

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979  
pp 9-11

ROMANOV, V. I., Candidate of Agricultural Sciences, Chuvash Agricultural Experimental Station

[Abstract] Application of essential fertilizers on erosion soils presents serious problems; about 630 thousand hectares in the Chuvash ASSR are affected by water erosion to some degree, and over 10 mil. t of soil are washed away yearly. This article reports study, 1974-1976, of suitable conditions for liquid application of ammonium nitrate for winter rye. The experimental area was on a southwest exposed slope, inclined 5-6°. Study of drain off of mineral content was recorded for four fertilizer situations: i)  $P_{60}K_{60} + N_{60}$  under plowing; ii)  $P_{60}K_{60} + N_{60}$  in autumn fertilization in the phase of rye tillering; iii) the same, with frozen ground; iv)  $P_{60}K_{60} + N_{30}$  under plowing +  $N_{30}$  in autumn in the phase of rye tillering. Eight variants of fertilizations were tested, the actual times for applications being governed by weather conditions and the state of the soil. These variants--involving season, plowing, autumn tillering phase, frozen ground, P and K use--are tabulated to show harvest yield as a function of time of liquid fertilization. The least effective time is autumn with its frozen ground. Autumn fertilization in the tillering phase has no advantage over early spring. References 7 (Russian).

[70-8586]

USSR

UDC 633.14:631.84

# RESPONSIVENESS OF WINTER RYE TO VARIOUS DOSES OF MINERAL FERTILIZERS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979  
pp 8-9

SOROKIN, M. I., Candidate of Agricultural Sciences, Mordovian Agricultural Experimental Station and IVOYLOV, A. V., head agronomist, "Yalga" Experimental Model Farm

[Abstract] The acreage usually allotted to winter rye has reached 190-200 thousand ha in the Mordovian ASSR but in recent years the crop yield has

decreased. Mineral fertilizing has now been tested (1973-77) on a local-adapted winter rye sort, Saratovskaya 4. Soil qualities on the experimental farm (for three fields) used are tabulated; the soil is leached and podsolized, average-loamy chernozem. The trial was run on a vetch-fescue field; after harvesting the latter, the ground was turned, fertilizer applied--ammonium nitrate, powdered superphosphate and 40% potassium salt and plowed to a depth of 20-22 cm. Doses of fertilizers were varied, e.g.,  $N_{31}P_{21}K_{16}$ , which was also doubled, tripled;  $N_{72}P_{54}K_{38}$ , also doubled and tripled. Increased yield was obtained due to the fertilizer: yields are tabulated, showing increases ranging from 3.7 to 16.0 hwt/ha. Increased quality of grain was also achieved, wherein the levels of low ( $N_{31}P_{21}K_{16}$ ), medium ( $N_{93}P_{63}K_{48}$ ) and high ( $N_{216}P_{162}K_{144}$ ) mineral fertilizer used did not give substantially-differing improvement. It is concluded that the average dose is expedient for the Mordovian ASSR, which is situated at a border of transition from moderately humid Northeast to a drying Southeast zone. No references.

[70-8586]

UFR

UDC 633.11:631.84

# INFLUENCE OF INCREASED DOSES OF NITROGEN FERTILIZER ON THE HARVEST OF WINTER WHEAT IN A NON-CHERNOZEM ZONE

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979  
pp 5-7

ZOLOTAREV, V. P., Candidate of Agricultural Sciences, and VAULINA, G. I., TsOS VIUA (Central Experimental Station of the All-Union Scientific Research Institute of Fertilizers and Soil Science)

[Abstract] Mineral and organic fertilizers are currently being used, in high doses, in the Central Economic Rayon to fertilize winter wheat fields. The present work was done in the Moscow Oblast on soddy-podzol, rich-loamy soil, using ammonium nitrate and urea at various periods of application under winter wheat Mironovskaya 808; the nitrogen fertilizer was added to soil treated with superphosphate and potassium chloride ( $P_{120}K_{120}$ ) in autumn before harvest and in the spring in top spreading. The trials were done in 1973-1975 at the authors' Central Experimental Station; the soil pH was 5.2; humus 2.8%;  $P_2O_5$  5.1 mg; and  $K_2O$  11.3 mg per 100 g of soil. The previous soil use was vetch-fescue fallow. Temperature for the three years was about the same (meteorological conditions are tabulated). Serious deficiency of moisture occurred in Aug/Sep 1972 and 1974 and May/Jun 1973. About 120 kg/ha N was used for the three years; yield of crops

is tabulated. N at levels of N<sub>180</sub> and N<sub>240</sub> had no apparent advantage vis-a-vis the N<sub>120</sub>. The saltpeter and urea did not differ in effect. The fertilizer should be applied 60 kg before harvest and 60 kg as a spread in spring. References 11 (Russian).

[70-8586]

USSR

UDC 633.11:631.84

DOSES AND PERIODS FOR APPLICATION OF AMMONIUM NITRATE UNDER WINTER WHEAT IN BELORUSSIA

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979 pp 4-5

YURSHEVICH, A. S., Candidate of Agricultural Sciences, BEZLYUDNAYA, I. I. and DOVIDENKO, T. D., Belorussian Scientific Research Institute of Agriculture

[Abstract] The title subject has already been studied in many soil and climatic zones of the nation; the present work has sought to find the optimal periods, and quantities of ammonium nitrate for winter wheat in the BelSSR. The work was done in 1974-1976 at "Zhodina," an experimental station of the Belorussian Scientific Research Institute of Agriculture. The soil was soddy, podzolic, light-loam soil, pH 5.6-6.6, humus 1.8%, P<sub>2</sub>O<sub>5</sub> 14-16 mg and K<sub>2</sub>O 8-10 mg/100 g. In 1974, there was moderate precipitation and lowered air temperature; 1975 was dry and hot; 1976, insufficient humidity, temperature average. Lupine with oats was the previous crop. The wheat sort was Mironovskaya 808. Background fertilization (superphosphate and KCl) was P<sub>80</sub>K<sub>80</sub>. Soil preparation is described; dose of fertilizer amounted to from 40 to 120 kg N/ha; application quantities and times--prior to planting, sprouting, before winter, various stages of growth--are tabulated, along with indices of grain quality. For the BelSSR, a dose of N<sub>120</sub> in the spring, at the beginning of vegetation (with a previous bean crop) appears to be the ideal fertilizing conditions. References 5 (Russian).

[70-8586]

## RESULTS OF A SOVIET STUDY OF THE EFFECTIVENESS OF N-SERVE NITRIFICATION INHIBITOR

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4(186), 1979  
pp 55-60

SMIRNOV, P. M., Professor, Moscow Agricultural Academy imeni K. A. Timiryazev, ARTYUSHIN, A. M., Candidate of Agricultural Sciences, Ministry of Agriculture USSR, DERZHAVIN, L. M., Candidate of Agricultural Sciences, and LITVAK, SH. I., Candidate of Agricultural Sciences

[Abstract] A report on Soviet-wide tests of N-serve nitrification inhibitor (2-chloro-6-(trichloromethyl)pyridine, Dow Chemical Company). This chemical retards nitrification for 1.5-2 months when applied to the soil in doses of 0.5-1% of the amount of nitrogen in fertilizer (0.5-1.5 kg of N-serve per hectare). The chemical has low phytotoxicity, and is not harmful to vegetation even in doses of 2-3 kg/ha. It was found that N-serve is highly effective on cotton and rice when used with nitrogen fertilizers such as urea and ammonium sulfate. This nitrification inhibitor also has a beneficial effect on winter wheat and potatoes in light soils of the non-blackearth zone. The inhibitor has an unstable effect on spring grain crops and maize with strong dependence on moisture conditions. The action of N-serve also depends on the amount of nitrogen in the fertilizer used, and the gain in yield from using the inhibitor decreases and disappears as the nitrogen content increases. The inhibitor also improves the quality of produce by preventing accumulation of harmful nitrates, and has a beneficial effect on the environment for the same reason.

[82-6610]

## EFFECTIVENESS OF DIFFERENT FORMS OF FERTILIZERS ON BARLEY FIELDS IN THE NORTHERN REGIONS BEYOND THE URALS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4(186), 1979  
pp 17-19

MAL'TSEV, V. F., Candidate of Agricultural Sciences, Tyumen' Agricultural Institute

[Abstract] A report on experiments done to determine the effectiveness of different fertilizers on the yield and grain quality of spring barley. The research was done in 1973-1975 on an experimental field of Tyumen' Agricultural Institute. The fertilizers studied were ammonium sulfate, ammonium nitrate, urea, double, simple and defluorinated superphosphate,

potassium chloride and potassium sulfate. It was found that nitrogen fertilizer has a decisive influence on increasing barley yield on leached black earth in this region. The investigated fertilizers had about the same effect on the harvest, although ammonium nitrate gave a better yield in wet years. The fertilizers had a beneficial effect on the chemical makeup of the grain and on grain quality.

[82-6610]

USSR

UDC 633.11:631.84

HARVEST AND GRAIN QUALITY OF SPRING WHEAT IN THE STEPPE REGION OF THE BURYAT ASSR WITH AMMONIUM NITRATE FERTILIZER

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4(186), 1979 pp 16-17

LAPUKHIN, T. P., Buryat Republic Agrochemical Laboratory, KOREN'KOV, D. A., Associate Member of the Lenin All-Union Academy of Agricultural Sciences, and ANIKST, D. M., Candidate of Agricultural Sciences, All-Union Scientific Research Institute of Fertilizers and Agricultural Soil Science imeni D. N. Pryanishnikov

[Abstract] A report on experiments to determine the effect of fertilizer on spring wheat yields and quality that were done in the steppe region of the Buryat ASSR in 1973-1976. The base fertilizer (ammonium nitrate and granulated superphosphate) was plowed into the soil in the autumn. Top dressing with ammonium nitrate was done during heading of the wheat. The action of nitrogen fertilizers was studied on two backgrounds: without fertilizer, and  $P_{60}$ . The results show that it is advisable to add nitrogen fertilizer in the heading phase of the crop under conditions where nitrogen could not be applied before planting, or where the dose in the base fertilizer does not exceed  $N_{30}$ . If the overall norm of nitrogen for the spring wheat is  $N_{60}$  or more, it should be applied before planting, since spacing part of the nitrogen to top dressing is not effective. References 7 (Russian).

[82-6610]

USSR

UDC 633.11:631/81

ON TECHNIQUES FOR APPLYING MINERAL FERTILIZERS IN DRY FARMING ON THE  
KULUNDA STEPPE

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4(186), 1979  
pp 10-15

SALMIN, L. N., Candidate of Agricultural Sciences, KOSHELEV, YU. M.,  
LAMANOV, A. A., Candidate of Agricultural Sciences, and SHUSHARIN, A. N.,  
Siberian Scientific Research Institute of Chemicalization of Agriculture

[Abstract] An analysis was made of data on mineral fertilizer application for grain crops under the arid conditions of Southwest Siberia. The results show that local application of phosphorus fertilizers gives very high increases in harvest, even when there is an extreme deficit of precipitation. The use of phosphorus fertilizers is essential for increasing the spring wheat yield in dry farming on the Kulunda Steppe. From the economic standpoint it is most effective to apply granulated superphosphate in the drill rows when planting in norms of P<sub>10-20</sub>. A promising technique is the application of superphosphate in a norm of P<sub>60-120</sub> on fallow fields in crop rotation farming. References 9 (Russian).

[82-6610]

USSR

UDC 631.82:633.12

EFFECT OF FERTILIZERS ON THE YIELD AND GRAIN QUALITY OF BUCKWHEAT

Moscow AGROKHIMIYA in Russian No 2, 1979 pp 53-58 manuscript received 27  
Mar 78

KUKRESH, N. P., Belorussian Scientific Research Institute of Agriculture,  
Zhodino, Minsk Oblast

[Abstract] The results are given of an investigation of the influence of mineral fertilizer doses on the yield and quality of buckwheat and of their influence on the intake and yield of nutrients. Experiments were conducted in 1974-1977 in sod-podzolic loamy soil at the Zhodino experimental center of the Belorussian Scientific Research Institute of Agriculture. Flax was a forerunner in 1974-1975, and oats in 1976-1977. Treatment of the soil for the buckwheat consisted of winter plowing to a depth of 16 to 18 cm and two fall harrowing sessions of the winter-plowed soil to a depth of 10 to 12 cm. Phosphorus and potassium were added in the fall during the second harrowing. Harrowing was performed three times in the spring at

five- to seven-day intervals, with a decrease in depth each time. Nitrogen fertilizer was added prior to the last harrowing, and prior to sowing the soil was compacted with a ring-and-spur roll. "Yubileynaya 2" buckwheat was sown in rows, 90 kg/ha of seeds. The kernel and straw were analyzed for nitrogen, phosphorus, calcium and magnesium content, and a determination was made of the protein and amino acid content in the hulled kernel. It was found that in sod-podzolic soils a nitrogen fertilizer exerts the best influence on increasing the yield of buckwheat and the content of protein and unsubstitutable amino acids. With respect to increasing the yield of buckwheat, a nitrogen fertilizer is best, followed by a potassium and then a phosphorus. Different types of mineral fertilizers showed a different influence on the protein content of the buckwheat kernel. Nitrogen and phosphorus fertilizers increased the content of protein in the kernel and its content increased with an increase in fertilizer doses. A chlorine containing potassium fertilizer added in the fall to winter plowed soil during harrowing made possible a definite improvement in the yield of buckwheat, but somewhat inhibited the accumulation of protein and unsubstitutable amino acids. A yield of buckwheat of 20.5 centners per hectare was achieved on average for the four years by employing an optimal norm for mineral fertilizers of N30P40K100, against a yield of 15.8 centners per hectare produced without using fertilizers. It was found that mineral fertilizers improve the entry of nitrogen, phosphorus and potassium into plants, but do not show a definite influence on the presence of calcium and magnesium in the kernel. Only nitrogen and phosphorus fertilizers increase the content of calcium in the straw and reduce the content of magnesium. Increasing the nitrogen dose increased the subtraction of all nutrients from the soil. The subtraction of phosphorus, potassium, calcium and magnesium was increased by increasing the phosphorus fertilizer dose and of potassium by using a potassium fertilizer, although a potassium fertilizer reduced the subtraction of calcium and magnesium. Increasing the dose of mineral fertilizers resulted in a reduction in the utilization factor for nitrogen, phosphorus and potassium in fertilizers. Seventeen amino acids were determined, including seven unsubstitutable, i.e., lysine, threonine, valine, methionine, isoleucine, leucine and phenylalanine. Study of the content of nutrients in the kernel and straw of buckwheat showed that it is directly dependent on weather conditions during the vegetation period and on mineral fertilizer doses. References 5 (Russian).

## EFFECT AND AFTEREFFECT ON GRAIN OF LITTER-FREE MANURE IN GROWING MAIZE

Moscow AGROKHIMIYA in Russian No 2, 1979 pp 73-77 manuscript received 10 Nov 78

KOVALFNKO, P. K., Chernigovsk Experimental Agricultural Station

[Abstract] The new technique of keeping animals without litter has resulted in the accumulation of a large quantity of litter-free manure. Studies were made to reveal the influence of litter-free manure as compared with manure containing litter on the yield of maize. Experiments were conducted in 1974-1976 at the experimental farm of the Chernigovsk Oblast Agricultural Experimental Station in the woodland area and in the forest-steppe area. The soil in the woodland area was dark gray podzol-developed soil with a pH of 4.6 to 5.6 and a humus content in the arable layer of 1.1 to 1.7 percent, a mobile phosphorus content of 13.5 to 17.8 percent and an exchange potassium content of nine to 10.3 mg per 100 g of soil. Experiments in the forest-steppe area were conducted on alkali-treated low-humus chernozem with a pH of 5.0 to 6.2, with a humus content in the arable layer of 2.9 to 3.7 percent, a mobile phosphorus content of 13.7 to 15.5 percent, and an exchange potassium content of 11.4 to 13.7 mg per 100 g of soil. The maize's predecessor was winter wheat. "Bukovinskiy 3TV" maize, a regionalized hybrid, was sown. Litter containing longhorn cattle manure was added in an amount of 40 t/ha after four-month storage, and 40 and 60 t/ha of litter-free. Organic fertilizers were added with the support of 60 kg/ha of phosphorus and potassium mineral fertilizers. Litter-free semi-liquid swine manure was used for fertilization in the woodland area, and liquid longhorn cattle manure in the forest-steppe area. It was found that in adding litter containing manure the content of nitrate nitrogen in the soil was considerably lower than when adding litter-free, since part of the nitrogen is used by micro-organisms which break down organic matter. In light soils of the woodland area the introduction of both kinds of manure did not influence the growth of plants, while in the forest-steppe area the highest plants were produced when adding litter containing manure, with somewhat lower plants when employing variants with liquid manure. In the woodland area litter-free manure showed a stronger influence on the rate of passage of individual phases of growth than did litter containing manure, whereas in the forest-steppe zone the opposite pattern was observed. It was determined that for light soils in a woodland zone the dosage of litter-free semi-liquid swine manure for maize should be set so that not less than 150 kg/ha of nitrogen are introduced along with it. No improvement in the yield of maize is achieved by further increasing the amount of nutrients with the added semi-liquid manure. In chernozem soils of the forest-steppe area, the dosage of liquid longhorn cattle manure should be set so that 100 to 110 kg/ha of nitrogen are added along with it. The aftereffect of litter-free manure

is considerably slighter than the aftereffect of litter containing manure in dark gray woodland soils. By approximately doubling the amount of nitrogen added along with litter-free manure, an identical aftereffect is observed. Tables are given of the total content of nutrients in manure of different kinds, of the content of nitrate nitrogen in the arable layer of soil when introducing litter containing and litter-free manure, of the yield of maize when fertilizing with litter containing and litter-free manure and of the yield of barley and oats when utilizing the aftereffect of added manure.

USSR

UDC 634.0.265:631.445.4:633.11

#### INFLUENCE OF FOREST AREAS ON THE NUTRIENT CYCLE OF ORDINARY CHERNOZEM FOR WINTER WHEAT

Moscow AGROKHIMIYA in Russian No 2, 1979 pp 83-89 manuscript received 21 Feb 78

KRETININ, V. M., All-Union Scientific Research Institute of Agricultural Afforestation, Volgograd

[Abstract] Land protecting forest areas considerably alter ecological conditions for the growth and development of winter wheat in a field between forest areas. The results are given of studies of the influence of forest areas on winter wheat in terms of its quality, the subtraction of nutritive elements and the nutrient cycle of the soil. Studies were conducted in Kuybyshevskaya Oblast in the area of the Volga AGLOS [Conservational Afforestation Experimental Station] in 1971-1974. Crop rotation fields were situated within a system of forest areas planted in 1951-1953 measuring 500 m in width. Five individual samples were put together to make up a mixed soil specimen. In fresh samples a determination was made of nitrate nitrogen by the disulfophenol method and of ammonia nitrogen with Nessler's reagent, and in dry samples, of mobile phosphorus. A determination was also made of nitrates in subsurface water and of the total nitrogen, phosphorus and potassium in the soil and plants, the latter by combustion in a mixture of sulfuric and hydrochloric acid. The climate of this area is a dry continental climate. The ordinary medium-thick heavily loamy chernozem has high fertility. "Mironovskaya 808" winter wheat was sown. Nitrates are washed away because of the accumulation of snow deposits near forest areas and deep drainage of the soil in the spring. Losses of nitrate nitrogen in a layer zero to 150 cm thick on average for the three years studied equaled 80 kg/ha on the leeward side of forest areas, 22 kg/ha on the windward side, and 20 kg/ha in the middle of the field. In subsurface water the content of nitrate nitrogen near

forest areas was about 4 to 7 mg/l, and 0.1 to 0.3 mg/l in the middle of a field. The soil's nitrogen supply was found to be sufficiently high in the spring for the entire extent of the field between forests and winter wheat does not require nitrogen fertilization in the spring remote from forest areas. Improvement with respect to the soil's nitrogen supply can be necessary after winters of heavy snowfall, especially in light soils. At different distances from forest areas winter wheat exhibits not only non-identical biometric indicators but also content of nutritive elements, for the content of nitrogen in the kernel and straw is increased in proportion to remoteness from forest areas and the content of phosphorus in the kernel and potassium in the straw is reduced. The subtraction of nutritive elements by a crop of winter wheat in the area of influence of forest areas is considerably greater than in the middle of a field. The nitrogen shortage is more than 19 to 40 kg/ha at a distance of zero to 10 times the height of forest areas from forest areas, and the phosphorus shortage, 12 to 22 kg/ha and the potassium shortage 17 to 32 kg/ha. It is necessary to supplement key nutritive elements for subsequent crop rotation. It is concluded that with a system of forest area protection favorable conditions are created for the water supply, growth and development of winter wheat. The soil's potassium supply is high, its nitrate nitrogen content is satisfactory, and its phosphorus and ammonia nitrogen supply is low. Nitrogen supplements are required for crop rotation. Under these conditions the yield of winter wheat is improved, but the nitrogen and phosphorus content in the kernel and the potassium content in the straw are reduced 10 to 30 percent. References 7 (Russian).

USSR

UDC 532.61:546.161-143

BULK AND SURFACE PROPERTIES OF KF-UF<sub>4</sub> MELTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 52 No 3, 1979 pp 669-670 manuscript received 3 May 78

DESYATNIK, V. N., YEMEL'YANOV, N. M. and SLOVESNOV, A. A., Urals Polytechnical Institute imeni S. M. Kirov

[Abstract] The results are given of investigations of the density and surface tension of melts containing potassium and uranium chloride, representative of mixtures with a common anion and cations with considerably different polarizing powers. The bulk properties of fused mixtures with a common anion can be altered by changing the composition of the mixture, which results in considerable changes in the second coordination sphere. The method of maximum pressure in a gas bubble was used for measuring the properties of fused mixtures. Measurements were made in carbon glass crucibles with capillary tubes made of molybdenum in an atmosphere of purified argon. Surface tension was calculated with the Kantor-Schroedinger equation. An isotherm is shown for the density of fused mixtures of KF and UF<sub>4</sub> at 1223°K. The density of the melts increases linearly with an increase in concentration of uranium fluoride. An isotherm is also given for deviation of molar volume from additivity, arrived at from the results of measuring the density of melts. A positive deviation in molar volumes from additivity over the entire concentration range was found to be typical of the system studied. Maximum disintegration of the melts was observed with a uranium fluoride concentration of about 40 molar percent. Uranium ions having great polarizing power are the nucleus of complex groupings formed in the melt. A surface tension isotherm shows the considerable surface activity of potassium fluoride as compared with uranium fluoride, and the surface tension of the mixture is reduced considerably by adding slight amounts of potassium fluoride to uranium fluoride. The experimental data for surface tension agree well with the theoretical. Figures 3; references 6: 4 Russian, 2 Western.

THE TERNARY SYSTEM  $\text{CaCl}_2\text{-UCl}_4\text{-ThCl}_4$ 

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 52 No 3, 1979 pp 693-694 manuscript received 7 Apr 78

DESYATNIK, V. N. and MEL'NIKOV, YU. T., Urals Polytechnical Institute imeni S. M. Kirov

[Abstract] The results are given of an investigation of the ternary system  $\text{CaCl}_2\text{-UCl}_4\text{-ThCl}_4$ , for the purpose of studying the behavior of uranium and thorium chloride in melts of alkali earth metals. Molten salts containing uranium and thorium chloride can be used for refining and producing metallic uranium or thorium electrochemically. A diagram is given of the fusibility of the system  $\text{CaCl}_2\text{-UCl}_4\text{-ThCl}_4$ . Results were obtained by the differential thermal method employing a derivative plotter while recording cooling curves. The melting points of the parent materials were  $780 \pm 2^\circ\text{C}$  for  $\text{CaCl}_2$ ,  $590 \pm 2^\circ\text{C}$  for  $\text{UCl}_4$  and  $786 \pm 2^\circ\text{C}$  for  $\text{ThCl}_4$ . The primary crystallization surface for this ternary system was plotted by studying eight polytherm cross sections passing through the peak of a concentration triangle for the composition of  $\text{UCl}_4$ , as well as by using information on the binary systems  $\text{CaCl}_2\text{-UCl}_4$ ,  $\text{CaCl}_2\text{-ThCl}_4$  and  $\text{UCl}_4\text{-ThCl}_4$ . The system  $\text{CaCl}_2\text{-UCl}_4\text{-ThCl}_4$  is a simple eutectic. The crystallization fields of  $\text{CaCl}_2$ ,  $\text{UCl}_4$ , and  $\text{ThCl}_4$  converge at the eutectic point of the composition, in molar percent,  $\text{CaCl}_2\text{--}40.0$ ,  $\text{UCl}_4\text{--}55.5$  and  $\text{ThCl}_4\text{--}5.5$ . Melts with the eutectic composition crystallize at  $480 \pm 2^\circ\text{C}$ . The results of these investigations prove that this system is a simple eutectic and that in this system there are compositions with low melting points, which can be used as electrolytes in the production and refining of uranium and thorium. Figures 2; references 9: 7 Russian, 2 Western.

USSR

UDC 621.359.7

## EFFECT OF THE SHIELDING OF ION-EXCHANGE MEMBRANES BY INERT SEPARATORS IN ELECTRODIALYSIS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian No 5, 1979 pp 1053-1058  
manuscript received 23 Mar 78

GNUSIN, N. P., ZABOLOTSKIY, V. I., PIS'MENSKIY, V. F. and LITVINOV, S. L.,  
Kuban' State University

[Abstract] Inducing intense turbulent mixing of solution is a way of intensifying electrodialysis. The turbulence is initiated within the laminar flow range by aligning inserts (separators) within the intermembrane spaces. But since they are impervious from the standpoint of diffusion and electrical current conduction, i.e., inert, these separators reduce the useful area of the ion-exchange membranes. In other words, a shielding effect is present, to the detriment of mass transport. This shielding effect was investigated in the presence of natural convection. Formulas for computing the degree of shielding as a function of the ratio of shielded surface area of the membrane to the total surface area are presented for different types of mesh-type separators on the basis of models previously developed for spheroids (N. P. Gnusin et al. V sb. "Teoriya i Praktika Sorbtsionnykh Protsessov." Voronezh, No 10, 114, 1975). It is shown that for the investigated separators, which have a regular structure, the degree of shielding of the membrane surface is a function of two dimensionless parameters, one of which determines the separator geometry and the other, the thickness of the diffusion layer. The theoretical findings are found to be in agreement with experiment. Figures 4; references 9: 8 Russian, 1 Western.

[94-1386]

USSR

UDC 66.074.34 : 661.183.123

## EXTRACTION OF AMMONIA FROM A STEAM-AIR MIXTURE WITH AN ION-EXCHANGE RESIN

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 52 No 3, 1979 pp 675-676  
manuscript received 30 Jan 78

VARENKO, V. P., KONDRASHEVA, A. L. and LITVINOV, L. YE.

[Abstract] The results are given of an investigation of the ability of the commercial sorbent cation exchanger KU-23 to extract ammonia from a

moist stream of a steam-air mixture and of a determination of its dynamic capacity for ammonia under specific conditions for sorption and regeneration of the sorbent. Sorbent KU-23 is representative of a strong acid cation exchanger in  $H^+$  form with an  $R-SO_3H$  group. Chemical absorption of ammonia with this kind of sorbent is based on the reaction of attachment of a proton to the ammonia molecule. KU-23 is a chemical analog of KU-2, but is distinguished from it by macroporosity. Investigations were made with three modifications of sulfonic acid cation exchanger KU-23: 10/60, 30/100 and 100/100, where the numerator indicates the content of the crosslinking agent, divinyl benzene, and the denominator, the quantity of pore-forming agent (BR-1 benzene) in relation to the sum of monomers, in percent by weight. The specific velocity of the steam-air stream was 0.6 and 0.15 l/min·cm<sup>2</sup>, the moisture content of the stream, 70 to 80 and 50 percent, the length of the layer of sorbent, 5.0 cm, and the temperature,  $20 \pm 3^\circ C$ . The initial concentration of ammonia in the stream was from 0.04 to 0.4 mg/l. A comparison was first made of the chemisorption activity for ammonia of the three modifications of KU-23 in tests on the first chemisorption cycle. It was found that cation exchanger KU-23 30/100 is the most active in the reaction for absorbing ammonia from a steam-air stream containing approximately 0.4 mg/l  $NH_3$ . Under the conditions indicated, the duration of the protective effect of 1 cm<sup>3</sup> of resin was more than 2000 min, and its dynamic capacity was 38.1 mg/cm<sup>3</sup> or 57.4 mg/g. A study was also made of the dynamic activity of sorbent KU-23 in cyclic operation. Regeneration conditions were selected by taking into account the chemical strength of the acid and the not too high thermal stability of the resin. For KU-23 30/100, its dynamic capacity was reduced to zero in the second cycle. It was shown that the  $[NH_4]^+$  complex is very strong. Furthermore, dehydration of the sorbent takes place as the result of thermal vacuum regeneration, which has a negative influence on its further ability to act as an absorbent of ammonia vapors. This was proven by the results of tests made to discover the influence of moisture content of the sorbent on its chemisorption activity and the influence of the moisture content of the steam-air stream on the dynamic activity of a chemical absorbent with all other things equal. A sample of resin KU-23 30/100 with a moisture content in the stream of 70 to 80 percent had a dynamic capacity of 38.1 mg/cm<sup>3</sup>, and of 21.0 mg/cm<sup>3</sup> when the moisture content of the stream was lowered to 50 percent. It is concluded that KU-23 can be used for the effective extraction of ammonia from a steam-air mixture containing ammonia in a quantity of 0.05 to 0.4 mg/l. The dynamic capacity of this sorbent under these conditions is 32 to 38 mg/cm<sup>3</sup>, or 3.6 to 5.7 percent by weight. Regeneration of this chemisorbent, i.e., its use in cyclic operation, is not feasible. References 4: 3 Russian, 1 Western.

## INVESTIGATION OF THE THERMAL STABILITY OF COMPLEX FORMS OF ION EXCHANGERS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 52 No 3, 1979 pp 533-537 manuscript received 12 Jan 78

KOPYLOVA, V. D., PORINYKH, N. V., KARIMOVA, L. V. and SHABANOVA, L. N.

[Abstract] The results are given of a study of the thermal stability of complex forms of ion exchangers, which swell well in water and other polar solvents, making it possible to recommend them for the sorption and separation of Lewis bases as effective catalysts combining the merits of homogeneous catalysts with the technological feasibility of heterogeneous catalysts. A study was made of the thermal stability of the sodium (I), copper (II) and nickel (II) forms of the sulfonic acid cation exchanger KU-2, of the carboxyl cation exchanger KB-4, and of forms of the polyamine anion exchanger EDE-10P and its complexes with ions of copper (II) and nickel (II). Cation exchanger KU-2 sorbs ions  $\text{Na}^+$ ,  $\text{Cu}^{2+}$  and  $\text{Ni}^{2+}$  as the result of electrovalent interaction with ionogenic groups of the polymer, and cation exchanger KB-4 sorbs the same ions as the result of ion ( $\text{Na}^+$  ions) exchange and the simultaneous realization of ion and coordination interaction ( $\text{Ni}^{2+}$  and  $\text{Cu}^{2+}$  ions) with carboxyl groups of the ion exchanger. Anion exchanger EDE-10P sorbs ions  $\text{Cu}^{2+}$  and  $\text{Ni}^{2+}$  as the result of their coordination action with amino groups of the polymer. Complex forms of the ion exchangers were produced under static conditions by contact of the sodium form of cation exchanger KU-2 and KB-4 and of the nitric acid semiprotonized form of ion exchanger EDE-10P with 0.2 N aqueous solutions of copper (II) chloride or nickel chloride. The ion exchanger solution ratio was 1:100, the experiment was conducted at  $20 \pm 1^\circ\text{C}$ , and the contact period was 24 h or longer until the establishment of equilibrium. The ion exchanger was then removed from the solution, rinsed with water and dried in air. The sorption capacity of cation exchanger KU-2 for  $\text{Na}^+$ ,  $\text{Cu}^{2+}$  and  $\text{Ni}^{2+}$  ions was respectively about 4, 3.38 and 3.42 mg-equiv/g, and of cation exchanger KB-4, 10.0, 7.61 and 7.18 mg-equiv/g. The capacity of anion exchanger EDE-10P for copper (II) ions was 5.28, and for nickel (II) ions, 3.58 mg-equiv/g. A study was made of the thermal stability of the ion exchanger by the differential thermal and gravimetric methods, using a derivative plotter. A hundred milligrams of the samples studied were placed in ceramic crucibles and calcined aluminum oxide was used as a standard for comparison. Heating was performed in air with a programmed rise in temperature at a rate of 5 deg/min to  $500^\circ\text{C}$ . Differential loss of weight and heat release curves were plotted. The results show that in the process of heating a loss of weight takes place, which is accompanied by different thermal effects, both endothermic and exothermic, which are caused by destruction of complexes of the polymer and by its oxidation. It was found that the presence in the phase of an ion exchanger of ions of transition metals, especially of copper (II) ions, accelerates the process of destruction of the polymer. There is not sufficient data to

explain the precise reason for this. Nickel (II) and copper (II) forms of ion exchangers exhibit poorer thermal stability, indicating the catalytic effect of ions of copper (II) and nickel (II) on processes causing the destruction of ion exchangers. Knowledge of this fact makes it possible to forecast the application of complex forms of ion exchangers as catalysts for various processes, including for the splitting of C-C and C-N bonds and for oxidation. The thermal stability of cation exchangers KU-2 and KB-4 in the forms studied is increased as follows: Na > Ni > Cu. The thermal stability of non-protonized and semi-protonized forms of anion exchanger EDE-10P differs but slightly, but it is better than complex forms of this anion exchanger formed by ions of nickel (II) and copper (II). Figures 3; references 19: 13 Russian, 6 Western.

USSR

UDC 678.06:661.183.12:541.14

#### PHOTOCHEMICAL SYNTHESIS OF CARBOXYL-CONTAINING HOMOGENEOUS ION-EXCHANGE MEMBRANE

Moscow PLASTICHESKIYE MASSY in Russian No 4, 1979 pp 13-15 manuscript received 7 Nov 77

ROZENBLYUM, N. D., KOCHERGINSKAYA, L. L., BARANOV, V. P., ZHITKOVA, L. G., SMIRNOVA, I. V., BURMAKINA, YE. V. and BAZENKOVA, K. V.

[Abstract] The possibility of the synthesis of homogeneous ion-exchange membranes on a semi-industrial scale is investigated. To this end the process of the UV-irradiation of polyethylene film with subsequent copolymerization of the film material with carboxyl-containing vinyl monomers in air at high temperatures was developed. The film used was 15-30 microns thick and the copolymerization was accomplished with carboxyl-containing vinyl monomers of the acrylic or methacrylic acid type with acrylonitrile and subsequent saponification. High-pressure 375-1000 watt mercury lamps were used. To increase the yield of macro-radicals the polyethylene film was treated with a toluene solution of benzophenone prior to irradiation. A 5-10% concentration of benzophenone solution was found to be optimal. If the polyethylene film has a surface of enhanced reflectivity, UV-irradiation time can be reduced to as little as 0.2-0.3 min; this is of major practical significance since then the production process can be readily accomplished by reeling the film under a beam of UV light and the valuable properties of the original polyethylene (strength, elasticity) can then be better preserved. The copolymerization then takes place throughout the film material, as confirmed by the low resistivity and sufficiently high ion-exchange capacity of the thus treated film. The developed procedure can be used to modify the properties of film and fabric materials, is suitable for industrial use, and assures safety of the process. Figures 2; references 11: 6 Russian, 5 Western.

[93-1386]

USSR

UDC 547.26.119

## ESTERIFICATION OF ARSINE OXIDES BY MEANS OF DIOLES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 817-822  
manuscript received 5 Jul 78

GAMAYUROVA, V. S., GORDEYEV, V. K. and CHERNOKAL'SKIY, B. D., Kazan'  
Chemico-Technological Institute

[Abstract] The possibility of esterifying arsine oxides by means of dioles was investigated in view of the fact that the polarity of the arsenyl group is higher than that of the phosphoryl group in the corresponding compounds, and also considering that the oxides of arsines and phosphines form adducts with catechols, which display a marked stability. To this end, and to prevent the reaction from stopping at the stage of these adducts with hydrogen bonds, the synthesis was performed in benzene. The reactants used were aliphatic and aromatic oxides of arsines and--as dioles--ethyleneglycol, propyleneglycol, and pinacone. The reaction resulted in the synthesis of cyclic esters of pentacoordinated arsenic--dioxarsolanes. By analogy with carbonyl compounds, it can be assumed that the mechanism of the reaction between arsine oxides and dioles is based on the transport of proton from the diol to the oxygen of the arsenyl group and the subsequent dehydration of the resulting intermediate product. The reaction may also follow the cyclic synchronous transport model. This also is why phosphine oxides do not react with dioles: the proton transport in the phosphoryl group is more difficult than in the arsenyl group. References 16: 8 Russian, 8 Western.

[92-1386]

USSR

UDC 547.242

## ARSENIZATION OF DIPHENYLOXIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 826-830  
manuscript received 30 Dec 77

YAROSHEVSKIY, A. B., KHLEBNIKOV, V. N., GAVRILOV, V. I., CHERNOKAL'SKIY, B. D., Kazan' Chemico-Technological Institute imeni S. M. Kirov

[Abstract] In recent years increasing interest has been shown in using phenoxyarsine derivatives as additives protecting polymers against

biological corrosion and as pesticides. Most phenoxyarsine derivatives are based on 10-chlorophenoxyarsine, but the methods for obtaining that compound are imperfect. In this connection, the possibility of obtaining 10-chlorophenoxyarsine from  $\text{AsCl}_3$  by treatment with diphenyl ester,  $\text{AlCl}_3$ , and oleum at 260-265°C is demonstrated. Of the catalysts investigated,  $\text{AlCl}_3$  is best, since it also serves as a source of chlorine. The yield of 10-chlorophenoxyarsine by this method reaches 79.2%. References 7 (Western).

USSR

UDC 547.257.1+547.235.44

## POTENTIOMETRIC TITRATION OF THE BORONFLUORIDES OF ARYLDIAZONIUM WITH COMPOUNDS OF TRIVALENT PHOSPHORUS IN ACETONITRILE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 890-893  
manuscript received 23 Sep 77

PETROV, S. I., ABRAMOV, V. N., FEDOTOV, A. N. and KAZITSYNA, L. A.,  
Moscow State University imeni M. V. Lomonosov

[Abstract] The interaction of aryldiazonium cations with the tripiperidide and trimorpholide of phosphorous acid, the dipiperidide of phenylphosphonous acid, and the tetrabutylidamide of butylphosphonous acid was investigated in acetonitrile by the potentiometric redoxmetric titration method. The findings on such titration of diazonium salts with nucleophiles in dipolar media point to the presence of a correlation between the half-titration potentials and the  $\sigma^+$ -constants of substituents in the benzene ring of the diazonium salt with the values of  $p$  similar for the nucleophiles used,  $p_{av} = 175$  mV. On the basis of these findings as well as of the literature data, a general correlation equation is derived for 7 nucleophiles:  $CN^-$ ,  $PhS^-$ ,  $R_3N$ ,  $P(NC_5H_{10})_3$ ,  $P(NC_4H_8O)_3$ ,  $PPh(NC_5H_{10})_2$ ,  $PBuOP(NBu_2)_2$ . Figures 1; references 10: 9 Russian, 1 Western.

[92-1386]

USSR

UDC 547.495.1

## DICHLOROANHYDRIDES OF N-ALKYL-N-(ALKOXYCARBONYL)AMIDOPHOSPHORIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 p 946 manuscript  
received 29 May 78

SHOKOL, V. A., GAMALEYA, V. F., MIKHAYLYUCHENKO, N. K. and KOZHUSHKO,  
B. N., Institute of Organic Chemistry UkrSSR Academy of Sciences

[Abstract] Dialkylchlorophosphites, as well as trialkylphosphites, react with esters of N-chloro-N-alkylcarbamic acid (Arbuzov reaction). The authors discovered that such relatively non-nucleophilic compounds as alkylidichlorophosphites also enter an Arbuzov reaction with N-chloro compounds, namely, with esters of N-chloro-N-alkylcarbamic acid. Then, however, the reaction occurs only in the presence of catalytic amounts of ferric chloride or other catalysts. Such a reaction results in a new type of N-phosphorylated urethanes--dichloroanhydrides of N-alkyl-N-(alkoxycarbonyl)amidophosphoric acid. Their structure was corroborated

by analytic data, IR, NMR  $^1\text{H}$  and  $^{31}\text{P}$  spectra, and transformation into diesters of N-alkyl-N-(alkoxycarbonyl)amidophosphoric acid. References 2 (Russian).

[92-1386]

USSR

UDC 547.414:547.241

METHODS FOR SYNTHESIZING 1-OXO-1-HYDROXY-3,4-DIMETHYL-3,4-DINITROPHOSPHOLANE AND 1-OXO-1-HYDROXY-4-NITRO-2-PHOSPHOLENE

Leningrad ZHURNAL OSHCHEY KHIMII in Russian No 4, 1979 p 947 manuscript received 20 Jul 78

YEFREMOV, D. A., BERESTROVITSKAYA, V. M. and PEREKALIN, V. V., Leningrad State Pedagogical Institute imeni A. I. Gertsen

[Abstract] The nitration of 1-oxo-1-hydroxy-3,4-dimethyl-3-phospholene (I) with nitrogen tetroxide and the hydrolysis of 1-oxo-1-alkoxy-3,4-dimethyl-3,4-dinitrophospholanes (II-VII) (brief boiling in alcohol in the presence of acid catalysts or prolonged heat treatment in aqueous solution) has resulted in the synthesis of 1-oxo-1-hydroxy-3,4-dimethyl-3,4-dinitrophospholane (VIII) (yield up to 97%), which was converted to the corresponding mononitroacid (IX) by boiling in an aqueous solution of sodium carbonate, accompanied by the elimination of nitrous acid. The synthesized products (VIII, IX) are the first representatives of five-member di- and mononitrocyclophosphinic acids. The individuality and element-by-element composition of the synthesized substances were corroborated by thin-layer chromatography and element-by-element analysis as well as by IR and PMR spectroscopy. References 3 (Russian).

[92-1386]

## ALPHA-PHOSPHONIUM ORTHOOXYTOLUENE AND ITS PROPERTIES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 p 948 manuscript received 9 Oct 78

KOLOGYAZHNYI, O. I., MATSNEV, V. V. and KUKHAR', V. P., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] It was established that  $\alpha$ -phosphonium-*o*-oxytoluene (I), synthesized by quaternizing 2-oxy-5-nitrobenzylchloride with tertiary phosphides, readily interacts with bases, giving off HCl and converting (with a high yield) to  $\alpha$ -phosphonium-*o*-tolueneoxide (II). The transformation of (I) into (II) occurs in a water-alcohol solution on interaction with ammonia. UV and NMR  $^{31}\text{P}$  spectroscopy points to a betaine structure of compound (II) with a 4-coordinated phosphorus atom. The chemical properties of  $\alpha$ -phosphonium-*o*-oxidetoluene also indicate a betaine structure. Compounds (II) get readily alkylated by methyl iodide and acylated by acyl chloride with respect to the anion center, with formation of phosphonium salts (III, IV). Betaines (II) interact with butyllithium at  $-70^\circ\text{C}$  in THF, as evidenced by green staining which at  $0^\circ\text{C}$  turns bright yellow.

[92-1386]

## SYNTHESIS OF P-P- AND P-Si-SUBSTITUTED YLIDS OF PHOSPHORUS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 p 949 manuscript received 9 Oct 78

KOLOGYAZHNYI, O. I. and KUKHAR', V. P., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] As a continuation of research into the chemistry of phosphorylated CH acids the reactions between the sodium derivatives of dicarbomethoxymethylphosphines (Ia) and phosphonites (Ib), on the one hand, and diisopropylchlorophosphine and trimethylchlorosilane, on the other, were investigated. These reactions were found to result in the formation of P-substituted products (II) and, to a smaller extent, O-substituted products (of type IV). Vacuum distillation isolated tetraisopropyldi-phosphinedicarbomethoxymethylid (II). The reaction between the enolates

Ia, Ib and trimethylchlorosilanes resulted in the formation of a mixture of P- and O-silicized products--P-Si-ylids (IIIa, IIIb) and keteneacetals (IVa, IVb). It is likely that the P-silicization of Na-enolates (I) and the formation of P-Si ylids (III) is due to the thermodynamic convenience of the phosphinemethylene group  $P = C(CO_2Me)_2$ . P-silicized ylids (III) represent vacuum-distillable fluids that get readily hydrolyzed by the moisture present in air. The possibility of the existence of a tautomeric equilibrium (III)  $\rightleftharpoons$  (IV) between the P-Si ylids (III) and the keteneacetals (IV) is not precluded. References 3 (Russian).

USSR

UDC 547.241

# EXCHANGE REACTIONS BETWEEN P<sup>III</sup> AMIDES AND ESTERS AND THE ACID CHLORIDES OF TRIVALENT PHOSPHORUS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 952-953 manuscript received 17 Oct 78

PUDOVIK, A. N., BATYYEVA, E. S., ZAMALETDINOVA, G. U. and GIRFANOVA, YU. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Affiliate of the USSR Academy of Sciences

[Abstract] Substitution reactions in the P<sup>III</sup> amide series occur in the presence of acid reagents. When catalytic quantities of hydrogen chloride are present in the acid chlorides of trivalent phosphorus, the hydrogen chloride may protonize the phosphamide with the formation of amine and acid chloride of P<sup>III</sup>. Addition of the still more reactive acid chloride to the system should result in an exchange reaction with the formation of a new amine and acid chloride of P<sup>III</sup>. And indeed it has been found that the diethylamide of diethylphosphorous acid enters exothermally into an exchange reaction with the acid chlorides of ethyleneglycolphosphorous acid and pyrocatechol. Products with P<sup>III</sup>-P' bonding also form from reactions between diethylamide of diethylphosphorous acid and ethylphenylchlorophosphine: analogous exchange reactions occur in the trialkylphosphite series. References 3 (Russian).

[92-1386]

## INTERACTION OF DITHIOACIDS OF PHOSPHORUS WITH TRIMETHYLSILYLISOCYANATE AND -ISOTHIOCYANATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 79 pp 724-727  
manuscript received 2 Feb 78

KUTYREV, G. A., NIGAMETZANOV, R. T., CHERKASOV, R. A. and PUDOVNIK, A. N.,  
Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] It was of interest to investigate the interaction between dithiophosphoric acids and isocyanate- and isothiocyanatesilanes; then as in the case of reactions with alcohols, participation by not only the  $N = C = X$  group but also the Si-N bond could be expected. Equimolar amounts of dimethyldithiophosphoric acid and trimethylisothiocyanatesilane when heated together for 6-7 hr, formed a white crystalline residue, O,O-dimethyl-S-thiocarbamoyldithiophosphate. The reaction of dimethyldithiophosphoric acid with trimethylisocyanatesilane was conducted under analogous conditions. On the basis of NMR-spectroscopic and IR data a corresponding reaction scheme is presented. It is concluded that reactions between dithioacids of phosphorus and trimethylsilylisocyanate and -isothiocyanate at first result in the disruption of the Si-N bond of isocyanatesilane and subsequently cause the second molecule of dithiophosphoric acid to become associated with isocyanic (isothiocyanic) acid, which leads to the formation of O,O-dialkyl-S-thiocarbamoyldithiophosphates and of the silyl esters of thio- and dithio-phosphoric acids, respectively. In this connection, the reaction with trimethylsilylisocyanate is accompanied by the "O,S-exchange process," characteristic of dithiophosphates. Figure 1; references 8: 3 Russian, 5 Western.

[92-1386]

## STEREOCHEMISTRY OF 1,3-DIPOLAR CYCLO-ASSOCIATION OF DIAZOETHANE WITH ALPHA-SUBSTITUTED VINYLPHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 79 pp 728-738  
manuscript received 23 Mar 78

GAREYEV, R. D. and PUDOVNIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] This is a continuation of an earlier investigation which dealt with an empirical model for evaluating the stereochemical orientation

of the reactions of the 1,3-dipolar cyclo-association of diazoalkanes with alpha-substituted vinylphosphoryl compounds, which established that the stereospecificity of the reactions between phosphorus-containing dipolarophiles and diazoalkanes is chiefly determined by the effective rather than the total volume of the substituents at the phosphorus atom, i.e., by the immediate neighborhood of the chiral center. Now an analogous test was used for comparative evaluation of the space requirements of the phosphorus fragments against the background of the groupings with known effective Van der Waals radii of the volume they occupy in space. To this end, the stereochemistry of reactions of the 1,3-dipolar cyclo-association of diazoethane with alpha-substituted vinylphosphonates, which serve to induce all at once two chiral centers, was investigated. It was established that such reactions result in the formation of a mixture of cis- and trans-isomers of 3-phosphorylated  $\Delta^1$ -pyrazolines. The absence of stereospecificity in these reactions is in good agreement with the remoteness of the spatially interacting groups due to their 1,3-position as well as with the manifestation of the competing "attracting" steric effect. The stereospecificity of the formation of cis- and trans-isomers of 1,2-dimethyl-1-dimethoxyphosphinylcyclopropane at photolysis of 3,5-dimethyl-3-dimethoxyphosphinyl- $\Delta^1$ -pyrazoline is due to the rapid "collapse" of the corresponding biradical intermediates in singlet state, while the formation of O,O-dimethyl- $\alpha$ -propylvinylphosphonate and E-isomer of O,O-dimethyl- $\alpha$ -methyl- $\beta$ -ethylvinylphosphonate from the secondary biradical intermediate is more preferable in triplet state. Figures 2; references 16: 12 Russian, 4 Western [including 2 in Russian translation]

[92-1386]

USSR

UDC 547.26'118

# REACTIONS BETWEEN THE MONOISOCYANATES OF ALKYLENEGLYCOLPHOSPHOROUS ACIDS AND TRIMETHYLPYRUVONITRILE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 79 pp 739-741  
manuscript received 7 Apr 79

KONOVALOVA, I. V., FASKHUTDINOVA, T. A., BURNAYEVA, L. A., MONAKHOVA, T. G. and PUDOVIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] The reactions between the isocyanates of ethylene- 1,2-propylene-, 1,3-propylene- 2,3-butylene-, and 1,3-butyleneglycolphosphorous acids and trimethylpyruvonnitrile were investigated. The reactions were conducted at room temperature in the absence of solvents. After the reaction

mixture is let stand for 1-2 hr, white crystalline products settle out. On the basis of IR and NMR spectral analyses the corresponding reaction schemes are proposed. It is shown that the isocyanates named above react with pyruvonnitriles to form reaction products having a 1:1 composition of dicyclic structure. These products are thermally unstable, decomposing at 90-150°C and turning into solid vitreous substances. References 5 (Russian).

USSR

UDC 541.571.9

#### CALORIMETRIC INVESTIGATION OF THE ELECTRON-DONOR PROPERTIES OF ORGANO-PHOSPHORUS COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 79 pp 741-747 manuscript received 10 Aug 77

KUCHERUK, L. V., GOL'DSHTEYN, I. P., SHCHERBAKOVA, E. S., GUR'YANOVA, YE. N., KURAMSHIN, I. YA. and PUDOVNIK, A. N., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] The effect of molecular structure on the intermolecular bonding energy was investigated on complexes of various organophosphorus compounds in the classes  $RR'R''P$  and  $RR'R''PX$  ( $X = O, S, Se$ ) with  $\sigma$ -( $I_2$ , *n*-chlorophenol) and  $-(SnCl_4$ , organo-tin chlorides) acceptors, is investigated. The most reliable information on the coordination bonding energy is provided by the enthalpy of formation of complexes as obtained by the method of calorimetry in vapors or sufficiently inert solvents. Accordingly, the composition and thermodynamic parameters of the formative reactions of complexes of organophosphorus donors with iodine in carbon tetrachloride, with tin chlorides in benzene, and with *n*-chlorophenol in octane, were determined by the calorimetric titration method. It is established that the coordination bonding energy for bonds formed between various electron acceptors and organophosphorus donors in  $RR'R''P$  and  $RR'R''PX$  ( $X = O, S, Se$ ) classes depends on a number of factors among which the most important are the conditions of the overlapping of the corresponding donor and acceptor orbitals, the donor ionization potentials, and the electrons surrounding the coordination centers. Further, the donor ability of organophosphorus compounds in both classes is markedly affected by the substituents at the P atom, which is adequately described by the Kabachnik constants. The donor-acceptor interaction energy is substantially influenced by the inductive and resonance effects of the substituents at the phosphorus atom. The susceptibility of the reaction centers to the effect of the substituents follows the sequence  $RR'R''PS > RR'R''P > RR'R''PO$ .

The equilibrium of the reactions of complexing between organophosphorus donors and compounds in the  $\text{Alk}_n\text{SnCl}_{4-n}$  class is markedly affected by the steric complications of the donor molecules. Figures 2; references 24: 21 Russian, 3 Western.

[92-1386]

USSR

UDC 547.544+547.539.132+547.243

ANION  $\sigma$ -COMPLEXES OF PHOSPHORUS COMPOUNDS. V.  $\sigma$ -COMPLEXES OF TRIALKYL-PHOSPHITES WITH 1,3,5-TRIS(TRIFLUOROMETHANESULFONYL)BENZENE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 748-751  
manuscript received 7 Apr 78

ONYS'KO, P. M., GOLOLOBOV, YU. G., BOYKO, V. N., IGNAT'YEV, I. V. and YAGUPOL'SKIY, L. M., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] This is a continuation of earlier investigations which had dealt with the trinitrobenzene series which showed that sulfone readily forms  $\sigma$ -complexes with a large series of nucleophiles. Now the possibility of the formation of phosphorus-containing  $\sigma$ -complexes by reacting 1,3,5-tris(trifluoromethanesulfonyl)benzene (I) with trialkylphosphites (II) is elucidated. The stability of the  $\sigma$ -complexes, which represent models for research on the mechanism of nucleophilic aromatic substitution, is due to both the electron and steric properties of the substituents in the benzene ring. Since the  $\text{CF}_3\text{SO}_2$  group is a much stronger electron acceptor than the  $\text{NO}_2$  group, the effect of the substitution of three nitro groups in trinitrobenzene with trifluoromethanesulfonyl substituents on the formation rate and stability of the corresponding  $\sigma$ -complexes was investigated. It had been expected that such a highly activated substrate as sulfone readily reacts with trialkylphosphites to form zwitterion  $\sigma$ -complexes. And indeed, it was established that upon reacting triethylphosphite with sulfone in the presence of dimethylsulfoxide the solution acquires a yellow color due to the formation of a  $\sigma$ -complex. Figure 1; references 12: 11 Russian [including 2 in English translation], 1 Western.

[92-1386]

USSR

UDC 541.49+546.98:541.128

SYNTHESIS AND CATALYTIC PROPERTIES OF COMPLEXES OF PALLADIUM WITH AMIDES OF PHOSPHOROUS ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 752-757  
manuscript received 23 Feb 78

TELESHEV, A. T., UZNETSOVA, N. V., ROZHDESTVENSKAYA, I. D. and NIFANT'YEV, E. YE., Moscow State Pedagogical Institute imeni V. I. Lenin

[Abstract] Complexes of group VIII metals containing derivatives of trivalent phosphorus as ligands represent an important group of hydrogenation catalysts. Usually tertiary phosphines and phosphites are used as such derivatives, whereas little is known about complexes based on amides of phosphorous acid. In this connection, the possibility of the synthesis of palladium complexes by reacting such amides with bis- $\pi$ -allylpalladiumchloride is investigated. It is established that the resulting palladium complexes are represented by ( $\pi$ -allyl)aminophosphine palladium chlorides. The probable direction of the complexing is the phosphorus atom. Interaction between ( $\pi$ -allyl)aminophosphinepalladium chlorides with  $\text{NaBH}_4$  in the presence of molecular hydrogen results in the formation of paramagnetic charge transfer complexes which represent active and selective catalysts of hydrogenation. Figures 3; references 9: 6 Russian, 3 Western.

[92-1386]

USSR

UDC 546.138:547.455

ALKYLGLYCOPHOSPHITES: SYNTHESIS, PALLADIUM COMPLEXES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 757-760  
manuscript received 6 Jun 78

NIFANT'YEV, E. YE. and KUKHAREVA, T. S., Moscow State Pedagogical Institute imeni V. I. Lenin

[Abstract] This is a continuation of earlier studies which showed that interaction between dialkyl- and alkylenephosphites, on the one hand, and bis- $\pi$ -allylpalladium chloride, on the other, results in crystalline complexes which, when treated with  $\text{NaBH}_4$  and oxidized, yield catalysts for a number of reactions whose activity is determined by the structure and stereochemistry of ligands. Given such an effect of ester radicals,

the synthesis and nature of complexes based on acid phosphites containing sugar residues was investigated. Of the two possible types of such substances--diglycophosphites and alkylglycophosphites--the latter was selected, since their phosphorus center is spatially more accessible to complexing. The alkylglycophosphites were synthesized by reacting diacetonehexose with an excess of elementary dialkylphosphites. A diastereomeric type of anisochronicity was recorded in the NMR  $^{31}\text{P}$  spectra of the synthesized alkylglycophosphites. The obtained alkylglycophosphites were used to synthesize palladium complexes displaying a high catalytic activity in the hydrogenation of nitrobenzene and diene and acetylene hydrocarbons. It was established that complexes based on alkylglycophosphites display catalytic activity in the hydrogenation of a broader range of substrates than the corresponding complexes synthesized on the basis of elementary dialkyl and 1,3-alkylenephosphites. Figures 2; references 8: 6 Russian, 2 Western.

[92-1386]

USSR

UDC 541.49:549.558.1+546.15

#### MOLECULAR COMPLEXING OF PHOSPHAZO COMPOUNDS WITH IODINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 760-764  
manuscript received 25 Jan 78

IVANOVA, N. A., BULGAREVICH, S. B., MOVSHOVICH, D. YA., KOGAN, V. A. and OSIPOV, O. A., Rostov-on-Don State University; Scientific Research Institute of Physical and Organic Chemistry under the Rostov State University

[Abstract] The ability of phosphazo compounds to form complexes with  $\text{I}_2$  is investigated. As donors, phosphazo compounds display several coordination centers: an undivided electron pair of the nitrogen atom and the  $\pi$ -system of aromatic rings or the  $\text{P} = \text{N}$  molecular bond. The findings on the high polarity of the investigated compounds demonstrate that the complexing is due to the undivided electron pair on the nitrogen atom. The formation of the molecular complexes of phosphazo compounds with  $\text{I}_2$  also is distinctly reflected in their electron spectra. Both the dipole moment method and the UV spectroscopy show that the resulting molecular complexes are of the  $n-\sigma$  type with coordination of  $\text{I}_2$  with respect to the nitrogen atom of the phosphazo group. The polarity of the investigated compounds points to a considerable transfer of charge from the donor molecule to  $\text{I}_2$ . This indicates that the structure with total charge transfer makes a substantial contribution to the stabilization energy of

the complex; thus phosphazo compounds represent extremely strong n-donors comparable to aliphatic amines. Figures 2; references 21: 15 Russian, 6 Western.

[92-1386]

USSR

UDC 547.341

INTERACTION BETWEEN ALKOXYVINYLDICHLOROPHOSPHINES AND PHOSPHORUS PENTACHLORIDE

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian No 4, 1979 pp 764-768  
manuscript received 6 Jun 78

FRIDLAND, S. V., YEFREMOV, A. I., MALKOV, YU. K. and BIKEYEV, SH. S.,  
Kazan' Chemico-Technological Institute imeni S. M. Kirov

[Abstract] Considering that the result of the heating of adducts of  $\text{PCl}_5$  with simple vinyl esters depends on the presence of phosphorus oxychloride in the system (the addition of the oxychloride leads to the segregation of compounds with P-C bond), while the heating of the adduct of  $\text{PCl}_5$  with styrene and its derivatives produces identical results with or without phosphorus oxychloride, the role of that oxychloride in the reaction was investigated. To this end, these reactions were simulated by investigating the synthesis of alkoxyvinyltetrachlorophosphoranes from alkoxyvinylchlorophosphines and  $\text{PCl}_5$  with and without phosphorus oxychloride. It was established that phosphorus acts as the nucleophilic centers during the first stage of the reaction, while oxygen takes over this role during the second stage. The presence of phosphorus oxychloride did not affect these findings. Thus it can be concluded that phosphorus oxychloride does not affect the transformations of the phosphoranes with P-C bond, while it most likely affects the stage of the interaction between  $\text{PCl}_5$  and simple vinyl esters. References 8 (Russian).

[92-1386]

## 2,4,6-TRIBROMOPHENOXYTETRACHLORO- AND BIS(2,4,6-TRIBROMOPHENOXY)TRICHLORO-PHOSPHORANES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 4, 1979 pp 769-772 manuscript received 15 Jun 78

KOZLOV, E. S., KOLESNIK, N. P., DUBENKO, L. G. and POVOLOTSKIY, M. I.,  
Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] According to Anschuetz, mixing  $\text{PCl}_5$  with a solution of 2,4,6-tribromophenol in benzene immediately initiates a vigorous reaction accompanied by the release of hydrogen chloride and the formation of 1-chloro-2,4,6-tribromobenzene. The authors continued the investigation of this reaction and found Anschuetz's findings to be incorrect. Upon the addition of  $\text{PCl}_5$  to a solution of 2,4,6-tribromophenol in benzene at  $20^\circ\text{C}$  with a reactant ratio of 1:1 there begins a slow release of hydrogen chloride, lasting about 3 days, and the reaction results in the formation of tribromophenoxytetrachlorophosphorane (I). An intense release of  $\text{HCl}$  commences only after the reaction mass has a reactant ratio of 1:2 and is heated to  $40^\circ\text{C}$  and ends at boiling of the mass. Then a mixture of phosphorane (I) and bis(2,4,6-tribromophenoxy)-trichlorophosphorane (II) is obtained. Thus, phosphoranes with not more than two tribromophenoxy residues can be isolated. NMR and PMR spectroscopy as well as chemical analysis indicate that phosphorane I can be used as a chlorinating agent in lieu of  $\text{PCl}_5$  in cases in which the separation of reaction products from phosphorus oxychloride is difficult or in which adequate solubility of chlorinating agent in organic solvents is needed. The 2,4,6-tribromophenyldichlorophosphate forming in these reactions is a crystalline product that is soluble in organic solvents and gets hydrolyzed in air. On interaction with methanol in the presence of triethylamine it yields 2,4,6-tribromophenyldimethylphosphate,  $2,4,6\text{-Br}_3\text{C}_6\text{H}_2\text{OP}(\text{O})(\text{OCH}_3)_2$ . References 2 (Western).

[92-1386]

## REDUCTION OF AZOXYBENZENE WITH PROPANOL-2 IN THE PRESENCE OF TRIPHENYL-PHOSPHINIC COMPLEXES OF RHODIUM AND RUTHENIUM

Moscow IZVESTIYA AKADEMII NAUK USSR, SERIYA KHIMICHESKAYA in Russian  
No 6, 1979 pp 1393-1395 manuscript received 20 Nov 78

SHARF, V. Z., FREYDLIN, L. KH., SAVCHENKO, B. M. and KRUTIIY, V. N.,  
Moscow Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR  
Academy of Sciences

[Abstract] In the presence of alkali-promoted  $\text{RhCl}(\text{PPh}_3)_3$  (I) and  $\text{RuCl}_2(\text{PPh}_3)_3$  (II) hydrogen gets transferred from propanol-2(P-2) to the  $\text{NO}_2$  group of nitrobenzene (NB) with formation of aniline (A). The alkali KOH promotes this process without changing its direction. It is shown that if KOH is used alone, the rate of the reduction of azoxybenzene is lower and the principal reaction products are azobenzene and hydrazobenzene rather than aniline. If, however, the same amount of KOH is combined with solutions of the Rh and Ru complexes (I) and (II), the yield of aniline is much higher. The Rh complex is more active than the Ru complex. References 1 (Russian).

[95-1386]

## REACTION BETWEEN ETHYLETHYLENEPHOSPHITE AND 1,1,1-TRIFLUOROACETONE

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA KHIMICHESKAYA in Russian  
No 6, 1979 pp 1391-1392 manuscript received 20 Nov 78

KIBARDIN, A. M., GAZIZOV, T. KH., GRYAZNOV, P. I. and PUDOVIK, A. N.,  
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan'  
Affiliate of the USSR Academy of Sciences

[Abstract] Trialkylphosphites interact under mild conditions with pentafluorobenzaldehyde and mono-, di- and trichloroacetic aldehydes to form derivatives of 2,2,2-trialkyloxy-1,4,2-dioxaphospholane. In this connection, as a continuation of earlier studies of the reactions between derivatives of  $\text{P}^{\text{III}}$  acids and carbonyl compounds, the interaction between ethylethylene-phosphite (I) and 1,1,1-trifluoroacetone (II) was investigated. This reaction, performed in abs. ether at a reagent ratio of 1:2, resulted in the segregation of crystalline 5-ethoxy-2,4-dimethyl-2,4-bis(trifluoromethyl)-1,3,6,9-tetraoxa-5-phosphaspiro[4,4]nonane (III). When reacted with dry

HCl at  $-50^{\circ}\text{C}$ , spiropospholane (III) turns into ethylene- $\mathcal{L}$ -trifluoromethyl- $\mathcal{L}$ -(1-oxy-1-trifluoromethyl)ethoxyethylphosphonate (IV). When heated, spiropospholane (III) turns into 5-ethoxy-2,3-dimethyl-2,3-bis(trifluoromethyl)-1,4,6,9-tetraoxy-5-phosphaspiro[4,4]nonane (V). The corresponding reaction schemes are presented. References 4: 3 Russian, 1 Western.

[95-1386]

USSR

UDC 546.183 + 547.467.32

#### THE REACTION OF TRIALKYLPHOSPHITES WITH AZIDOCARBOXYLIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 21-25 manuscript received 4 Jul 78

GUSAR', N. I., CHAUS, M. P. and GOLOBOV, YU. G., The Institute of Organic Chemistry, Academy of Sciences of the Ukrainian SSR

[Abstract] Procedures showed that the reaction of azidoacetic acid with trialkylphosphites produced O,O-dialkyl-N-(alcoxycarbonylmethyl)amidophosphates, rather than O,O,N-trialkyl-N-(carboxymethyl)amidophosphates as might be expected through imide-amide regrouping. The reaction apparently takes place through the stage of betaine formation. To study the possibility of a shift in alkyl groups, the structure of products of azidoacetic acids with triphenylphosphines was also investigated. In this reaction a high temperature residual was formed which in hydrolysis yielded an oxide of triphenylphosphine and glycine hydrochloride. Procedures followed are specified in the experimental section. References 5: 2 Russian, 3 Western.

USSR

UDC 547.241

#### THE REACTIONS OF FULL PHOSPHITES WITH LINKED BROMONITROALKENES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 25-36 manuscript received 8 Dec 77

GAREYEV, R. D., LOGINOVA, G. M., ZYKOV, I. N. and PUDOVNIK, A. N., The N. E. Baumann Veterinary Institute, Kazan

[Abstract] In mild conditions of  $30^{\circ}\text{C}$  in a diethyl ether medium, the reaction of trimethylphosphite with 1-bromo-1-nitro-3-methyl-1-butene

yielded a crystal adduct of phosphorane structure, while in more extreme temperatures, between 60 and 70°C, the reaction produces five different phosphorous compounds. The compounds obtained were studied by infra-red, proton magnetic resonance, and nuclear magnetic double resonance spectroscopy. The intermediate compounds are related to the elimination of bromide and nitrite ions in the reaction. Study of the antibacterial activities of the compounds obtained showed that a 1-0.5% concentration killed 100% of coliform bacteria and golden staphylococcus. The procedures followed are specified in the experimental section. Figures 4; tables 2; references 13: 9 Russian, 4 Western.

USSR

UDC 547.26'118

THE REACTION OF A MONOISOCYANATE OF DIMETHYLPHOSPHOROUS ACID WITH CHLORAL AND CHLOROACETONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 36-38 manuscript received 9 Jan 78

KONOVALOVA, I. V., NOVIKOVA, N. K., BURNAYEVA, L. A., MOSHKINA, T. M. and PUDOVNIK, A. N., The V. I. Ul'yanov-Lenin Kazan State University, Kazan

[Abstract] The reaction of dialkylisocyanatophosphites with alpha-halogen-carbonyl compounds using chloral and chloroacetone show that the mono-isocyanate tested reacts with chloral to form cyclic bonds like those of other aldehydes. Differential thermal analysis from -12°C to -5°C indicated the formation of a bipolar ion on the carbon atom of the chloral carbonyl group. Chloroacetone had a lesser reaction capability. At room temperature an equimolar mix of chloroacetone and dimethylisocyanatophosphite formed a sticky liquid that was then broken down into 2-methyl-2-chloromethyl-3,3-dimethoxy-3-phosphaoxaz-3-ol-5-on, 2,4-dimethyl-2-chloromethyl-3-methoxy-3-phosphaoxazolidine-5-on, and 2-methyl-2-chloromethyl-3,5-dimethoxy-3-phosphaoxaz-4-ol. The test with chloral formed 2-trichloromethyl-3,3-dimethoxy-3-phosphaoxa-3-ol-5-on, and diastereomer 2-trichloromethyl-3-methoxy-3-oxo-4-methyl-3-phosphaoxazolidine-5-on. Procedures are specified in the experimental section. References 7: 6 Russian, 1 English.

ANION SIGMA-COMPLEXES IN REACTIONS OF PHOSPHOROUS COMPOUNDS WITH  
TRINITROBENZENE: IV THE FORMATION OF DIALKYLPHOSPHITE SIGMA-COMPLEXES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 39-42 manuscript  
received 6 Jan 78

ONYS'KO, P. P. and GOLOLOBOV, YU. G., The Institute of Organic Chemistry  
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[Abstract] The reaction of diethylphosphite and trinitrobenzene in a solution of dimethylsulfoxide was shown to bring intense coloration related to the formation of sigma-complexes. The kinetics of complex formation of these reagents was studied by spectrophotometer to compare the reactivity of trialkylphosphites and acidic phosphites in dimethylsulfoxide. Proton magnetic resonance spectra showed that the unsubstituted carbon atom of trinitrobenzene is attacked by dialkylphosphite forming a P-C and not an O-C bond. Results indicated that dialkylphosphites formed anionic sigma-complexes that in time changed into 2,4,6-trinitrophenylphosphonates. Corresponding trialkylphosphites showed greater reaction capability than dialkylphosphites. Procedures are specified in the experimental section. Table 1; references 9: 6 Russian, 3 English.

1,3,2-OXAZA-4-PHOSPHOLINES WITH TRIVALENT PHOSPHORUS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 42-47 manuscript  
received 2 Feb 78

BALITSKIY, YU. V., KASUKHIN, L. F., PONOMARCHUK, M. P. and GOLOLOBOV, YU. G., The Institute of Organic Chemistry of the Academy of Sciences of the Ukrainian SSR

[Abstract] To determine the mechanism of the heterocyclization of alpha-(N-alkyl)aminoketones in the presence of triethylamine, with phosphorous trichloride, the reaction of aminoketones with mono- and dichloranhydrides of trivalent phosphoric acids was studied. The reaction capability of phosphorus in phospholines depended on spatial factors and the electron effect of the unsaturated substituent  $-OC(Bu-t) = CHNR-$ . The structure of the synthesized compounds was confirmed by proton and nuclear magnetic resonance spectroscopy. Imide formation of the five-membered oxazophospholane and corresponding oxazo-4-phospholines using phenylazide showed

that introduction of the double C=C bond into the cyclic fragment significantly reduced the nucleophilicity of trivalent phosphorus. Tables 3; references 14: 13 Russian, 1 English.

USSR

UDC 547.558.1

THE REACTION OF ARYLDICHLOROPHOSPHINES AND ARYLDICHLOROPHOSPHITES WITH  
PRIMARY AROMATIC AMINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 48-53 manuscript  
received 7 Sep 77

TRISHIN, YU. G., CHISTOKLETOV, V. N. and PETROV, A. A., The "Lensovet"  
Leningrad Technological Institute and the Leningrad Technological Institute  
for Cellulose and Paper Production

[Abstract] Study of the reactions cited with varying alkalinities showed that arylldichlorophosphines that have a highly electrophil phosphorous atom react vigorously with the primary aromatic amines, forming dianilides of arylphosphonic acids. The reaction apparently involved 2 consecutive actions of nucleophil substitution of a chlorine atom onto the phosphorous atom as the electrophil center. Changes in alkalinity had no apparent effect. Due to the high sensitivity of dianilides of phosphorous acids to moisture and oxygen, procedures were conducted in a dry argon atmosphere. Other procedures in the experiments are specified in the experimental section. Tables 2; references 15: 5 Russian, 10 Western.

USSR

UDC 547.341

THE SYNTHESIS AND STRUCTURE OF BIS-(BROMPHENYL)-1,3-BUTADIENEPHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 54-60 manuscript  
received 12 Jan 78

MASHLAKOVSKIY, L. N., BEREZINA, G. G., ZAKHAROV, V. I. and IONIN, B. I.,  
The "Lensovet" Leningrad Technological Institute, Leningrad

[Abstract] The initial compounds for the reactions were obtained by the reaction of diene dichloranhydride with sodium methylate in methanol, or with methylmagnesiumiodide in sulfur ether, while the previously unknown bis-(bromphenyl)-1,3-butadienephosphonates were produced by the reaction

of bromphenols having from 1 to 3 bromine atoms in the *o* or *p* positions of the benzene ring, in a benzene medium in the presence of an organic base. Purity and structure were confirmed by element analysis, thin-layer chromatography, and spectroscopy. Proton magnetic resonance spectroscopy showed that the chemical shifts of protons correlate best with the phosphorous electron acceptor substitution properties. Results showed the high stereospecificity of the dehydrochlorination of the dichloranhydride of 4-chlor-2-butenphosphonic acid with the production of a trans-isomer of diene dichloranhydride, while a similar reaction with a dichloranhydride of 4-chlor-2-methyl-2-butenphosphonic acid produced a nearly equimolecular mixture of *E*- and *Z*-isomers. Trans-1,3-butadienedichlorophosphonate was also produced. Procedures are specified in the experimental section. Figures 3; tables 3; references 8 (Russian).

USSR

UDC 547.241

#### THE REACTION OF TRIALKYLPHOSPHITES WITH DERIVATIVES OF TRICHLOROACETIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 60-63 manuscript received 2 Dec 77

KUKHAR', V. P. and SAGINA, YE. I., The Institute of Organic Chemistry of the Academy of Sciences of the Ukrainian SSR

[Abstract] To test the hypothesis that polychloroalkanes like  $\text{CCl}_3\text{X}$  where X = an electroacceptor group would react with trialkylphosphites with substitution of several chlorine atoms onto phosphoryl groups, the reaction of trialkylphosphites with trichloroacetonitrile was tested. Introduction of a single phosphoryl group did not reduce the electrophil nature of the alpha-carbon atom, but may have increased it, so that the reaction of trichloroacetonitrile made possible a subsequent reaction that produced diphosphoryl compounds. The effect of triethylphosphite on bis (dialcoxyphosphonyl)chloroacetonitriles led to protodechlorination. Procedures are specified in the experimental section. References 13: 4 Russian, 9 Western.

1,3,2-DIAZAPHOSPHORINANES: II. THE SYNTHESIS AND STEREOCHEMISTRY OF  
1,3-DIMETHYL-1,3,2-DIAZAPHOSPHORINANES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 64-74 manuscript  
received 23 Jan 1978

NIFANT'YEV, E. YE., ZAVALISHINA, A. I., SOROKINA, S. F., BORISENKO, A. A.,  
SMIRNOVA, YE. I., KUROCHKIN, V. V. and MOISEYEVA, L. I.

[Abstract] In the synthesis of cyclic amides of a number of 1,3,2-diazaphosphorinanes, the substitution of tertiary butyl radicals on methyl radicals causes no significant changes in the reaction, and the reaction of chloranhydrides with diethylamine does not produce the expected triamides. The present study was to explain these phenomena. The structure of the products obtained was confirmed by nuclear magnetic resonance spectroscopy. In the spectra the hydrophosphoryl fragment is characterized by doublet signals. Previously unknown N,N'-dimethyl-1,3,2-diazaphosphorinanes were synthesized, and the presence of geometric isomers was discovered by spectroscopy in a number of ethers, amides, and hydrophosphoryl compounds of 1,3,4-trimethyl-1,3,2-diazaphosphorinanes. The most common isomers were trans-isomers with an axial orientation on the phosphorous atom. Procedures are specified in the experimental section. Tables 5; references 11: 4 Russian, 7 Western.

PHOSPHORYL AMIDINE SYSTEMS: A STUDY OF SPATIAL ISOMERISM ON PHOSPHORYL  
S,N-DIALKYLISOTHIUREAS BY THE CARBON-13 AND PHOSPHORUS-31 NUCLEAR  
MAGNETIC RESONANCE METHOD

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 74-78 manuscript received 18 Aug 77

NEGREBETSKIY, V. V., BOGEL'FER, L. YA., GRAPOV, A. F., ZONTOVA, V. N. and  
MEL'NIKOV, N. N., The All-Union Scientific Research Institute for Chemical  
Means of Plant Protection

[Abstract] Structural transformation in N-phosphonyl-S-alkylisothiureas was studied in nuclear magnetic resonance spectra to determine minor changes in molecular structure, and to identify synantiisomers. At temperatures as low as -90°C the compounds were found to exist in one isomer form. The temperature, concentration and nature of the solvent

was found to be a key rather than the synantiisomers involved. Chemical shifts in carbon atom signals of  $\text{SCH}_3$  and  $\text{NCH}_3$  groups were found to result from anisotropic effects of adjacent atoms, and were not due to minor size differences. The syn- form was found to be more advantageous in analytical methods. A delayed rotation around the C-N bond was observed. Figures 2; tables 2; references 5: 2 Russian, 3 Western.

USSR

UDC 547.241

ORGANIC CHLOROPHOSPHONIUMHEXACHLOROPHOSPHATES IN REACTIONS WITH ORGANIC LITHIUM COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 78-82 manuscript received 12 Dec 77

DMITRIYEV, V. I., TIMOKHIN, B. V. and KALABINA, A. V., The Institute of Petroleum and Carbon Chemical Synthesis of the A. A. Zhdanov Irkutsk State University, Irkutsk

[Abstract] To confirm the need for the presence of a chlorophosphonium cation of the type  $\text{R}_n\text{PCl}_{4-n}$  in reducing chlorides of pentacoordinate phosphorus, the reactions of several organic lithium compounds with the organic chlorophosphoniumhexachlorophosphates were studied, where the molecules had a fixed chlorophosphonium fragment. The formation of asymmetrical tertiary phosphines confirmed the reaction, and the anion part of the phosphorous halogen also reacted with lithium alkyls. Model reactions indicated that reduction of the cation part of the molecule occurred with equimolar quantities of the reagents. Seven equivalents of phenyllithium were required for complete conversion. Procedures are specified in the experimental section. Tables 2; references 16: 9 Russian, 7 Western.

USSR

UDC 547.241 : 661.718.1

THE SUBSTITUENT EFFECTS OF PHOSPHORUS ON SHOWING INTRAMOLECULAR REACTIONS  
IN THE ULTRA VIOLET AND QUADRUPOLE RESONANCE SPECTRA OF DERIVATIVES OF  
ARYLPHOSPHONIC AND ARYLTHIOPHOSPHONIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 83-87 manuscript  
received 17 Feb 78

DOROKHOVA, V. V., RATOVSKIY, G. V. and DMITRIYEV, V. I., The A. A. Zhdanov  
Irkutsk State University, Irkutsk

[Abstract] The effects of the substituent on the conjugation mechanism with unsaturated groups was studied, and it was found that in phenyl derivatives the intensity of dispersion increases in the order  $\text{Alk} < \text{F} < \text{Cl}$ . Fluorine and chlorine atoms did not exhibit the donor effect, but the chlorine atoms served as acceptors. The effects of groups containing phosphorus was markedly greater for compounds containing donor substituents in paired position on the benzene ring. The nature of the effect is affected by the involvement of vacant chlorine atom bonding orbitals in bonding orbitals of the phosphorous groups. Quadrupole resonance spectrum parameters reveal a greater reaction of halogenthiothiophosphoryl groups with the  $\pi$ -electron system of the unsaturated substituents compared to halogenphosphoryl groups. The involvement of vacant sulfur bonding orbitals with free molecular bonding orbitals of the thiophosphoryl group and greater P=S polarity, are the causes. Tables 3; references 17: 12 Russian, 5 Western.

USSR

UDC 547.241

THE EFFECT OF THE SUBSTITUENT VINYL GROUP ON THE PHOSPHOROUS ATOM IN THE  
ELECTRON DONOR CAPABILITY OF THE PHOSPHORYL GROUP

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 87-90 manuscript received 5 Dec 77

LIPATOVA, I. P., MOSKVA, V. V., SITDIKOVA, T. SH., ANTROPOVA, YE. I. and SAMARTSEVA, S. A., The S. M. Kirov Chemical and Technological Institute, Kazan

[Abstract] The intermolecular hydrogen bonds of phenol with certain vinyl organic phosphorous compounds were studied by infra-red spectroscopy. The durability of the hydrogen complexes was determined by spectral changes observed during the formation of hydrogen bonds. Analogous data were

compared for triethylphosphin oxide, ethoxydiethylphosphinate, and diethoxyethylphosphonate. The results obtained are related to changes in the substituent vinyl group's ability to mesomer reactions with the phosphoryl group. The electron donor capability of the P=O group was shown to be determined by induction and resonance factors of the substituents in the vinyl group and induction factors of other substituents on the phosphorous atom. Procedures are specified in the experimental section. Tables 2; references 4: 3 Russian, 1 Western.

USSR

UDC 547.451 + 317.2

NITROALKYLPHOSPHONATES: VI. ACIDITY AND CERTAIN REACTIONS OF ORGANIC ALPHA-NITROALKYLPHOSPHOROUS COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 90-93 manuscript received 30 Dec 77

PETROV, K. A., CHAUZOV, B. A., BOGDANOV, N. N. and AGAFONOV, S. V.

[Abstract] The study attempted to gain a precise understanding of the electron acceptor action of groups containing phosphorus, by determining the acidity of 6 compounds through potentiometer titration in 50% aqueous ethanol, water, and 100% ethanol. Results indicated that varying the substituent on the phosphorous atom did not affect the acidity of the tested compounds. Spatial factors had various effects, and the acidity of nitromethyl-alpha-nitroethyl-, and propylphosphonates was similar; that of alpha-nitropropionate and -butirate was markedly lower than that of nitroacetate. The high acidity of organic alpha-nitroalkylphosphorous compounds was related to their lowered reaction capability. The acidifying action of alkoxy-, alkyl- and phenylphosphinyl groups corresponded to that of carbethoxy groups and they were insensitive to spatial factors. The tested compounds could be connected to chloral and benzalaniline and could be condensed with n-nitrophenyldiazonium chloride and triethylformate. Procedures are specified in the experimental section. Tables 2; references 2 (Russian).

## AMINOETHERS OF THIOPHOSPHORIC ACIDS. VI. THE REACTION OF MONOETHANOLAMINE WITH CHLORANHYDRIDES OF THIOPHOSPHORIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 93-97 manuscript received 13 Dec 77

GUPALO, A. P., KHMILEVSKAYA, M. I. and TSEPUKH, N. YE., The Lvov Institute of Forest Technology

[Abstract] The reaction of monoethanolamine with O,O-diethylchlorothiophosphate and O-ethylidichlorothiophosphate in a medium of chloroform and diethyl ether was tested relative to temperature and the ratio of reagents. The ratio of 2 : 1 for the first, and 4 : 1 for the second, brought a reaction and formation of aminoethers and a hydrochloride of monoethanolamine. Chlorothiophosphates were found to react with monoethanolamine independent of the ratio of reagents and of temperature only with the hydroxyl group, forming the corresponding aminoethers. Dichlorothiophosphates reacted similarly, but with a stoichiometric ratio of components and low temperature, they also reacted with the amino group, forming cyclic amidoethers of thiophosphoric acid. Procedures are specified in the experimental section. Table 1; references 8 (Russian).

## THE REACTION OF CERTAIN DERIVATIVES OF STYRYLDICHLOROPHOSPHINE WITH PHOSPHOROUS PENTACHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 98-100 manuscript received 9 Nov 77

FRIDLAND, S. V. and YEFREMOV, A. I., The S. M. Kirov Chemical and Technological Institute, Kazan

[Abstract] Derivatives with a known P-C bond were studied. After the reaction of styryldichlorophosphine with phosphorous pentachloride the mixture was evacuated to remove all phosphorous trichloride, leaving a crystal that was readily identified as styryltetrachlorophosphorane. An analogous reaction without intermediate phosphorane was achieved using beta-phenyl-beta-chlorovinylidichlorophosphine. The end product of the former reaction was alpha-chloro-beta-phenylvinylidichlorophosphine; for the latter, it was beta-phenyl-alpha,beta-dichlorovinylidichlorophosphine. Analogous results were obtained with beta-phenyl-beta-chlorethylidichlorophosphine. Results were related to the density of electrons at the

alpha-carbon atom. Procedures are specified in the experimental section. References 7: 6 Russian, 1 German.

USSR

UDC 547.241

#### THE REACTION OF SECONDARY CHLOROPHOSPHINES WITH ALPHA,BETA-DICARBONYL COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 100-103  
manuscript received 5 Sep 77

NURTDINOV, S. KH., MASHIRSKAYA, I. M., ISMAGILOVA, N. M., ZYKOVA, T. V., SALAKHUTDINOV, R. A. and TSIVULIN, V. S., The S. M. Kirov Chemical and Technological Institute, Kazan

[Abstract] The reaction of diethylchlorophosphine with diacetyl, acetoacetic ether, and acetylacetone was studied. It was found that the compounds react in equimolar quantities, but with varying temperature conditions ranging from 15-20°C for the first and third compound, to 80-100°C for 6-10 hours for the acetoacetic ether. The structure of the products obtained was determined by proton magnetic resonance, nuclear magnetic resonance of phosphorus-31, and infrared spectroscopy. The products of the reactions were a chloranhydride of diethylphosphonous acid, and corresponding oxides of diethyloxoalkylphosphines. The procedures are specified in the experimental section. Figure 1; references 5 (Russian).

USSR

UDC 547.341

#### NEW METHODS FOR SYNTHESIZING PHOSPHOROUS ILIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 104-116  
manuscript received 13 Dec 77

KOLODYAZHNYI, O. I., The Institute of Organic Chemistry of the Academy of Sciences of the Ukrainian SSR

[Abstract] Largely unknown ilides as substituents on phosphorous atoms were synthesized using trivalent phosphorus with a movable atom of hydrogen in the alpha-position. The compounds contained the grouping P-CHXY which could reduce into the phosphinomethylene group and in reactions with

electrophils, form ilides with various substituents. Synthesis was conducted in an ether or tetrahydrofuran medium in the total absence of natural moisture or oxygen to avoid substitution of a second hydrogen atom. The structure of phosphoryl-CH acids was confirmed by infrared, proton magnetic resonance, and P-31 nuclear magnetic resonance spectroscopy, as well as by chemical transformations. Phosphines and phosphonites reacted with carbon tetrahalogenides by detaching from the intermediate haloform to form P-halogenilides. Variants of this compound are discussed in detail. Ilide-phosphonate regroupings were observed using infrared and nuclear magnetic resonance of H-1 and P-31. With heating the compounds tested easily were changed in P-halogenilides with the halogen atom on the amino-, alkoxy-, thioalkoxy-, alkyl-, or trimethylsilyl groups. With heating, ilides with alcoxyl groups regroup with one of the alkyl groups moving to the carbon ilide atom. Procedures for obtaining P-halogenilides and other tested compounds are described in the experimental section. Tables 2; references\* 26: 16 Russian, 10 Western.

USSR

UDC 541.127 + 524.943.5 + 547.258.11

THE EFFECTS OF DONOR CAPABILITY OF CERTAIN ORGANIC AND ORGANIC PHOSPHOROUS COMPOUNDS ON THE REACTION CAPABILITY OF TRIETHYL TIN CHLORIDE WITH OZONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 160-165  
manuscript received 7 Feb 78

TARUNIN, B. I., PEREPLETCHIKOV, M. L., ALEKSANDROV, YU. A., LIOGON'SKAYA, T. I. and POMERANTSEVA, E. G., The Scientific Research Institute of Chemistry at Gorky State University

[Abstract] Acetophenon, benzophenon and a number of organic phosphorous compounds were used to study ligand band electrodonor properties in relation to catalytic action of the compounds in the reaction of triethyl tin chloride with ozone. As with dimethylformamide, all the compounds speeded the ozonolysis. The kinetic effect was interpreted from the position of the specific solvation effect of the initial organic tin compounds with the indicated compounds. Variations in the specific catalytic effect of the different compounds are discussed, and the conclusion reached that there is a meaningful correlation between the ozonolysis constant rate and the reduction of frequency of the P=O valent oscillations. The oxidation rates of organic tin compounds with ozone were found to be sensitive to the process of complexing and directly tied to the strength of donor-acceptor reaction. Mathematical calculations indicated that tripropylphosphinic oxide was one of the most active ligands. Independent spectrophotometric measurements showed a 1 : 1 ratio of organic tin

compounds to the ligand. Procedures are specified in the experimental section. Figures 4; tables 2, references 9 (Russian).

USSR

UDC 547.419.254-36

**ETHERS OF ARSENIC ACIDS: SYNTHESIS, ALKALINITY IN NITROMETHANE, AND PROTON MAGNETIC RESONANCE SPECTRA**

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 174-180  
manuscript received 3 Aug 77

GAMAYUROVA, V. S., SAVDUR, V. I. and CHERNOKAL'SKIY, B. D., The S. M. Kirov Chemical and Technological Institute, Kazan

[Abstract] Syntheses of a number of arsenic acid ethers were studied in terms of nucleophil properties, relative alkalinity in nitromethane, and infrared and proton magnetic resonance spectra. Ethers were obtained by direct etherification of arsenic acids with suitable spirits. The ethyl ethers had a lower yield with arsenic acids than their propyl or butyl analogs. The structure of the ethers was confirmed by infrared spectroscopy. Potentiometer titration was used to measure the relative alkalinity of the ethers with nitromethane as a solvent. Ethers of dialkylarsinic acids were found to have greater alkalinity than ethers of diphenylarsenic acids. Results confirmed the authors' earlier conclusion that inductive effects of substituents bonded to the arsenic atom were the main determiner of alkalinity of quadricoordinate arsenic compounds. Procedures are specified in the experimental section. Figures 3; tables 3; references 13: 11 Russian, 2 Western.

CERTAIN DERIVATIVES OF DI-m-TOLYLARSINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 181-183  
manuscript received 8 Dec 77

GIGAURI, R. D., CHERNOKAL'SKIY, B. D., GODERDZISHVILI, L. I. and SHATAKISHVILI, T. N., The Red Banner of Labor State University of Tbilisi, and the S. M. Kirov Chemical and Technological Institute, Kazan

[Abstract] Di-m-tolylalkylarsines were obtained from the reaction of a Grignard reagent and di-m-tolylchlorarsine, in diethyl ether. The individual properties and structures of the synthesized compounds were confirmed by element analysis and infrared spectroscopy. Chlorarsine reactions were quite complete, apparently due to the lesser solubility of potassium chloride compared to cyanide and potassium thiocyanate. Potassium cyanide and di-m-tolylchlorarsine reacted without a solvent with a good yield of cyanarsine, while acetone was used as a solvent in the arsine compounds reactions with potassium thiocyanate, producing an isothiocyanate of di-m-tolylarsine. Procedures are specified in the experimental section. Figure 1; table 1; references 10: 6 Russian, 4 Western.

## PARTIAL ASYMMETRICAL SYNTHESIS AND STEREODIRECTIVITY OF CERTAIN REACTIONS OF CHIRAL ETHERS OF ARSINIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 pp 184-188  
manuscript received 12 Jun 78

IONOV, L. B., KOROVYAKOV, A. P. and CHERNOKAL'SKIY, B. D., The 50th Anniversary of the USSR State University of Udmurt, and the S. M. Kirov Chemical and Technological Institute, Kazan

[Abstract] Synthetic, optically active tertiary amines, particularly (—)-N,N-diethyl (1-phenylethyl) amine, were used as catalysts to obtain stereoisomer enriched ethers of alkylphenylarsinic acids by the reaction of alkylphenylchlorarsines with spirits. The availability and possibility of using anode forms were advantages of chiral tertiary amines over alkaloids. The stereoselectivity of these reactions was found to be related to factors such as the temperature of the reacting mass, concentration, rate and order of adding reagents to each other, as well as to

the structure of the reagents. Some of the ethers obtained were thermally unstable. Enantiomers of ether of alkylphenylarsinic acids were found to change into tertiary arsines with Grignard reagents. The cyclohexyl ether of ethylphenylarsinic acid broke down upon heating to form diethylphenylarsine and a dicyclohexyl ether of arsonium acid. Procedures are specified in the experimental section. Tables 2; references 16: 10 Russian, 6 Western.

USSR

UDC 547.539.15 + 541.124

#### A NEW NITROXYL CONTAINING PHOSPHORUS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 p 232 manuscript received 26 Jun 78

SHERMOLOVICH, YU. G., MISYURA, A. V., POLUBRIK, O. M. and MARKOVSKIY, L. N., The Institute of Organic Chemistry, the Academy of Sciences of the Ukrainian SSR

[Abstract] The reaction of perfluorophenyl containing phosphines with stable radicals such as diphenylpicrylhydrazide, triphenylverdazide, and indophenoxyl in organic solvents is described showing the rapid breakdown of the radicals and formation of leuco compounds, partly because of high polarity and also due to relatively poor stability. The formation of relatively stable nitroxyl compounds containing phosphorus was examined by electron paramagnetic resonance spectroscopy which showed 6 basic components of nearly equal intensity. The reaction studied was thought to take place through the mechanism of synchronic substitution of the free radical. References 2: 1 Russian, 1 English.

USSR

UDC 547.241

THE REACTION OF BIS(CHLOROMETHYL)- AND TRIS(CHLOROMETHYL)PHOSPHINOXIDES  
WITH SODIUM SILANOLATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 p 233 manuscript  
received 15 Jun 78

ROMANENKO, V. D., TOVSTENKO, V. I., ROSENKO, L. A. and MARKOVSKIY, L. N.,  
The Institute of Organic Chemistry of the Academy of Sciences of the  
Ukrainian SSR

[Abstract] Phosphinoxides containing more than one alpha-alkyl halide  
group per molecule were found to react with sodium silanolate at a 1 : 3  
ratio in a solution of dimethylformamide at 20°C for 30 minutes forming  
alpha-, beta-unsaturated phosphonic acids, such as vinylphenylphosphonic  
acid and vinyl(chloromethyl)phosphonic acid. Steps in the reaction and  
specific procedures are presented. References 5: 3 Russian, 2 Western.

USSR

UDC 547.241

BETA-IODALKYLPHOSPHONIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 p 234 manuscript  
received 12 Jun 78

FEDOROVA, G. K., ANAN'YEVA, L. G. and DELYAGINA, T. M.

[Abstract] On heating with 57% hydroiodic acid, beta-chloroalkylphosphonic  
acids react producing beta-iodoalkylphosphonic acids, which are more stable  
in relation to alkalis and undergo titration by forming two equivalents  
without separation of hydrogen iodide or breaking of the C-P bond. Ele-  
mental, infrared and proton magnetic resonance spectroscopy were also  
conducted. References 2: 1 Russian, 1 English.

USSR

UDC 547.915.5

AN IMIDAZOLIDE METHOD FOR PRODUCING A PHOSPHODIETHER STRUCTURE IN A NUMBER OF GLYCEROPHOSPHOLIPIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 1, 1979 p 235 manuscript received 12 Jun 78

SUKHANOV, V. A., BASHARULI, V. A., KAPLUN, A. P. and SHVETS, V. I., The M. V. Lomonosov Moscow Institute of Fine Chemical Technology, Moscow

[Abstract] To produce a nitroxyl derivative of phosphatidic acid, use of an imidazolidine of phosphatidic acid is proposed. The method used involves the reaction of 1,2-distearol-gas-glycero-3-phosphate and carbonyldiimidazole. The method is also suitable for obtaining a phosphodiether bond where the hydroxyl-containing component is poorly soluble under usual conditions. The structures of the compounds yielded were verified by infrared spectroscopy. References 4: 1 Russian, 3 Western.

USSR

UDC 542.91:546.22'131

SYNTHESIS OF PHOSPHORUS DICHLOROTHIOPHOSPHORYLIMIDOTRICHLORIDE

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA KHIMICHESKAYA in Russian No 4, Apr 79 p 924 manuscript received 24 Nov 78

KHODAK, A. A. and GILYAROV, V. A., Institute of Organoelemental Compounds, Academy of Sciences USSR, Moscow

[Abstract] Phosphorus dichlorothiophosphorylimidotrichloride (thiopentachloride)  $\text{Cl}_3\text{P}=\text{N}-\text{P}(\text{S})\text{Cl}_2$  was synthesized by treating  $\text{Cl}_3\text{P}=\text{N}-\text{P}(\text{O})\text{Cl}_2$  with phosphorus pentasulfide. The reaction runs for 6-8 hours at 150-155°C. A second method involved treating quasiphosphonium salt with phosphorus pentasulfide in sym-tetrachloroethane with boiling for 10-15 minutes. The structure of the chloride produced by the two methods is confirmed by infrared and NMR spectra. References 6: 2 Russian, 4 Western.

[79-6610]

USSR

UDC 542.97:547.1'118

# CATALYTIC PHOSPHORYLATION OF PENTAFLUOROPHENOL WITH PHOSPHORIC ACID CHLORIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA KHIMICHESKAYA in Russian  
No 4, Apr 79 pp 896-900 manuscript received 8 Jun 78

KABACHNIK, M. I., ZAKHAROV, L. S., KUDRYAVTSEV, I. YU., KHARCHENKO, A. P.,  
TATAUROV, G. P. and KOROBEYNIKOVA, L. I., Institute of Organoelemental  
Compounds, Academy of Sciences USSR, Moscow

[Abstract] A detailed investigation was made of phosphorylation of pentafluorophenol with phosphoryl chloride, aryl- and polyfluoroalkylchlorophosphates. It was found that the process is catalyzed by  $\text{LiCl}$ ,  $\text{CaCl}_2$ ,  $\text{KCl}$ ,  $\text{NaCl}$ ,  $\text{BaCl}_2$  and  $\text{Mg}$ . The reaction mixture containing pentafluorophenol, the acid chloride and the corresponding catalyst was heated to 100-220°C and reaction was allowed to proceed for 0.5-21 hours. The reaction conditions depend on the type of catalyst and the structure of the final product. The proposed technique was used to synthesize a number of phosphates without chlorine in the aromatic rings. Chlorine replacement of fluorine was not observed even in synthesis of complete phosphates requiring the most severe conditions of phosphorylation. References 9: 5 Russian, 4 Western.

[79-6610]

USSR

UDC 542.91:547.1'118

# DISPROPORTIONATION OF DI( $\alpha$ -HYDROXYALKYL)PHENYLPHOSPHINES AND THEIR DERIVATIVES

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA KHIMICHESKAYA in Russian  
No 4, Apr 79 pp 866-869 manuscript received 9 Nov 77

ARBUZOV, B. A., YERASTOV, O. A. and KHETAGUROVA, S. SH., Institute of  
Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Affiliate of  
the Academy of Sciences USSR

[Abstract] An investigation was made of acetylation products of  $\alpha$ -hydroxyalkyl derivatives of phenylphosphines in a mixture of acetic acid and acetic anhydride. It was found that di( $\alpha$ -hydroxyethyl)phenylphosphine and tri( $\alpha$ -hydroxyethyl)phenylphosphonium chloride undergo disproportionation with heating in the reaction mixture, to form 5-phenyl-2,4,6-trimethyl-1,3,5-dioxaphosphorinane. Di(hydroxymethyl)phenylphosphine and di( $\alpha$ -hydroxyethyl)-phenylphosphine oxide are acetylated under the same conditions. References 6: 5 Russian, 1 Western.

[79-6610]

## REACTION OF DIISOPROPYLDITHIOPHOSPHORIC ACID WITH CARBOXYLIC ACID NITRILES

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA KHIMICHESKAYA in Russian No 4, Apr 79 pp 861-866 manuscript received 4 Oct 77

PUDOVIK, A. N., CHERKASOV, R. A., ZIMIN, M. G. and ZABIROV, N. G., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] An investigation was made of the reaction of diisopropyldithiophosphoric acid with benzoic and phenylacetic acid nitriles, adipic acid dinitrile and ethyl cyanoacetate. The reactions were done in the presence of catalysts for 15 days. The final products of these reactions are thioamides and tetraisopropyltrithiopyrophosphate. The reaction apparently begins with protonation of the nitrogen atom of the  $C\equiv N$ , leading to inclusion complexes, imidoxyldithiophosphates. These unstable adducts are regrouped to form the corresponding phosphorylated thioamides. The subsequent course of the reaction involves splitting of P-N-C or P-S-C bonds of N-(O,O-diisopropylthiophosphonyl)thioamides, and probably the imidoxyldithiophosphates under the action of the second dithio acid molecule. References 10: 4 Russian, 6 Western.

[79-6610]

STRUCTURE OF ORGANOPHOSPHORUS COMPOUNDS. 7. CRYSTALLINE AND MOLECULAR STRUCTURE OF DIMETHYLAMMONIUM O,O'-DIISOPROPYLDITHIOPHOSPHATE  $[NMe_2H_2]^+ [(i-PrO)_2PS_2]^-$ 

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA KHIMICHESKAYA in Russian No 4, Apr 79 pp 783-786 manuscript received 16 Nov 77

KALININ, A. YE., ANDRIANOV, V. G. and STRUCHKOV, YU. T., Institute of Organoelemental Compounds, Academy of Sciences USSR, Moscow

[Abstract] Research is done to establish the geometric characteristics of possible H-bonds in the structure of dimethylammonium O,O'-diisopropyl-dithiophosphate  $[NMe_2H_2]^+ [(i-PrO)_2PS_2]^-$  and to compare the geometry of the anion in this compound with that of potassium salts. It was established that the cations  $[NMe_2H_2]^+$  and anions  $[(i-PrO)_2PS_2]^-$  are joined in the molecule by hydrogen bonds of the N-H...S type with the participation of both active hydrogen atoms of the cation. The geometric parameters of the

bonds are quite usual for bonds of this type. The cations and anions are joined in endless chains along the c-axis. The geometric parameters of the anion in this phosphate are compared with those of potassium O,O'-dimethyl- and O,O'-dibenzylidithiophosphates. The lengths found for the bonds show good agreement for the three compounds, and there is some difference in the SPS, OPO and POC valence angles. The authors thank L. I. Samaray for furnishing the crystals and for interest in the work. Figure 1; references 12: 4 Russian, 8 Western.

[79-6610]

USSR

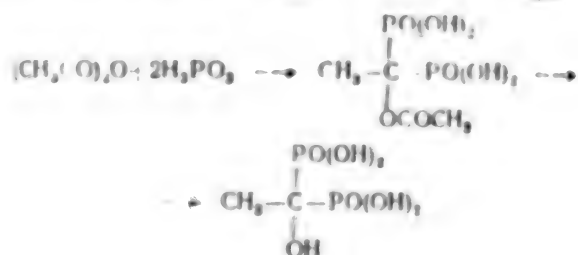
UDC 658.272.004.8:[661.7:547.297.56/.57]

# USE OF BY-PRODUCTS OF PHOSPHORUS-CONSUMING PROCESSES FOR THE SYNTHESIS OF ORGANOPHOSPHORUS COMPLEX-FORMING REAGENTS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, 1978 pp 277-278

URINOVICH, YE. M., SMIRNOVA, V. A., BIKHMAN, B. I. and DYATLOVA, N. M.

[Abstract] Methods were examined to reduce industrial waste containing significant quantities of  $\text{PCl}_3$  and recover useful P-containing compounds. Analysis of the by-products used indicated that they contained a complex mixture of P compounds, also containing a high percentage of oxygen. The first step was the recovery of acetyl chloride by reacting  $\text{PCl}_3$  with acetic acid. The indigo blue residue after the separation of the acetyl chloride removal was converted into 1-oxyethylidendiphosphonous acid (OEDP). A laboratory synthesis for this compound can be written as follows:



The OEDP is a unique compound in that its complexes with many cations, in particular the alkaline earth metals and easily hydrolyzable elements, have very high stability constants. Such complexes can form even in strongly acid environments. The effects of parameters such as temperature, the ratios of reactants, and the length of the individual stages on the

yields are considered. The maximum yield of the monosodium salt of OEDP from the industrial source of P was obtained using an acetic anhydride : phosphorous acid ratio of 1.2 : 1. (Phosphorous acid accounts for about 90-93% of the P in the industrial wastes). The use of the chloroacetic anhydrides of synthetic fatty acids for the synthesis of OEDP and its salts permits the preparation of chloroanhydrides with practically no waste. References 5 (Russian; includes a French patent listed in Russian).

USSR

UDC 547.468.133+547.558.1

#### PHOSPHORUS-CARBON DYADIC TAUTOMERISM

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 247 No 4, 1979 pp 866-870  
manuscript received 1 Feb 79

MASTRYUKOVA, T. A., LEONT'YEVA, I. V., ALADZHEVA, I. M., PETROVSKIY, P. V., FEDIN, E. I. and KABACHNIK, M. I., Academician, Institute of Organoelemental Compounds, USSR Academy of Sciences

[Abstract] To see whether dyadic phosphorus-carbon tautomerism of dialkylphosphites in their sulfur- and nitrogen-containing analogs exists, a substituted phosphinomethylene ( $\text{Ph}_3\text{P}-\text{C}(\text{COOEt})-\text{PPh}_3$ ) was protonated in an argon atmosphere at temperatures from  $-120$  to  $-20^\circ\text{C}$ , as the ratio of the phosphinomethylene to  $\text{HCl}$  was varied from 1:1 to 1:10. At  $-80^\circ\text{C}$  and a ratio of 1:1.5 in solution in  $\text{CH}_2\text{Cl}_2$ , data from the nuclear magnetic resonance (NMR) spectrum of  $^{31}\text{P}$  showed that two compounds were present, each containing two nonequivalent phosphorus atoms. The PH and CH conformational tautomers were thus regarded as existing due to the corresponding changes seen in the chemical shift and in the  $J(\text{PP})$  of the phosphine ring of the phosphorus atom. This finding was confirmed by NMR spectral data for  $^{13}\text{C}$  recorded when the corresponding solution contained only the CH-conformational tautomer. A table gives the effect of  $\text{HCl}$  concentration, temperature and solvent on the tautomeric equilibrium of the CH and PH forms of the substituted phosphinomethylene. Figure 1; tables 3; references 15: 8 Russian, 7 Western.

[85-10123]

USSR

UDC 613.6+613.262/:632.95

## WORKING CONDITIONS IN THE AGRICULTURAL USE OF LINURON

Moscow GIGIYENA I SANITARIYA in Russian No 3 Mar 79 pp 72-73 manuscript received 22 May 78

BUSLOVICH, S. YU., ALEKSASHINA, Z. A., BORUSHKO, N. V., VOINOVA, I. V., VOYTIK, N. P., DUBENETSKAYA, M. M., KOLOSOVSKAYA, V. M. and PATENT, R. L.

[Abstract] The title study was done on the "Krasnoye" sovkhos, Molodeckanskiy Rayon of Moscow Oblast, in 1976. The linuron had been applied to protect "Nantskaya" carrots and "Ogonek" potatoes. Application was affected by fluctuations in air temperatures (from 10 to 21.2°C), relative humidity (48 to 72%) and air movement (0.5 to 3.3 m/s). Air content of linuron fluctuated sharply at various times of application--preparing sprayers, wind during application, or time present on the field. Apparently, with appropriate adherence to rules of sanitation, the use of linuron has no negative action; further, no serious residue levels are left in the harvested carrots or potatoes. The agent receives approbation. No references.

USSR

UDC 632.954

## TESTING BAZAGRAN ON FIELDS OF OATS AND WINTER WHEAT

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4(186), 1979 pp 45-46

LODOCHKIN, P. I., Candidate of Agricultural Sciences and ZAIKINA, Z. S., All-Union Institute of Plant Protection

[Abstract] Bazagran was tested for effectiveness against weeds that are resistant to 2,4-D. The tests were done in 1974-1977 on fields of winter wheat and oats (with and without undersowing of clover) on the Tolstopal'tsevo experimental production farm in Moskovskaya Oblast. The herbicide was applied in doses of 2-4 kg/ha, and the weed population was counted before spraying and 30 days after spraying. The results of the tests showed that bazagran does not have any toxic effect on winter wheat, oats or clover, and is effective in destroying corn mayweed and snakeweed that are resistant to 2,4-D.

[82-6610]

## INFLUENCE OF HERBICIDES ON YIELD AND GRAIN QUALITY OF SPRING WHEAT

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4 (186), 1979 pp 44-45

PLOSZYNSKI, M. and RYNOWSKA-GRYNCZUK, B., Institute of Agricultural Technology, Fertilizers and Soil Science, Laskowice, Poland

[Abstract] A report on work done in 1975 to determine the influence of herbicides on the harvest and grain quality of spring wheat of the Kasper variety. The experiments were done on the Osika State Farm in Lublin Wojewodstwo. The herbicides were applied to the wheat seedlings. The chemicals that were tested included sufiks, 2,4-DA, keropur, aniten, khvastoks D, khvastoks M, Banvel M. It was found that the herbicides have no detrimental effect on crop yield. The herbicides had a slight effect on the total phosphorus and individual fractions in the grain. Versions with khvastoks showed some increase in the concentration of inorganic phosphorus, whereas versions with keropur and Banvel M showed some increase in the content of phosphorus fractions that are insoluble in 5% trichloroacetic acid. Khvastoks D increased the phytin content somewhat, and Banvel M reduced it. The herbicides had no effect on the fractional makeup of nitrogen in the grain. References 5 (Polish).

[82-6610]

## COMBINED EFFECT OF DEEP TILLAGE AND HERBICIDES ON WEEDS AND ON THE YIELD OF IRRIGATED CROPS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4(186), 1979 pp 39-44

IVANOV, P. K., Doctor of Agricultural Sciences, [deceased], and KIRIYENKO, I. F., Saratov Agricultural Institute

[Abstract] A report is presented on experiments done in 1972-1976 in Yershovskiy Rayon of Saratovskaya Oblast to determine the effect that tillage to depths of 22-25 and 30-32 cm combined with herbicides has on the yield of maize, spring wheat and winter wheat in crop rotation. Maize was treated with amine salt of 2,4-D (1.5 kg/ha) in the phase of 3-4 leaves, atrazine (2 kg/ha) during cultivation before planting, and trifluralin (2 kg/ha) on the surface of the soil after seeding. Amine salt

of 2,4-D in a dose of 1.5 kg/ha was used on spring wheat fields, except that in the version with a combination of atrazine and a single cultivation, the 2,4-D treatment was left out. Herbicides were not applied to winter wheat fields. It was found that increasing the depth of tillage from 22-25 to 30-32 cm considerably reduces weeds in maize fields, and increases the yield of maize, as well as the harvest of the following spring wheat and winter wheat crops. When amine salt of 2,4-D is used on maize, one of the cultivations between rows can be eliminated, the yield of green mass of maize increases by 13%, and there is a positive aftereffect on the following crops. Combined use of trifluralin and 2,4-D with deep tillage enables restriction to a single cultivation between rows instead of three, and increases the green mass of maize by 65% with corresponding increases of 15% for spring wheat, and 16% for winter wheat. References 3 (Russian).

[82-6610]

USSR

UDC 547.829'83.07:543.422.25.4

# SYNTHESIS OF PYRIDINIUM YLIDS, 1,4-DIHYDROPYRIDINES AND INDOLIZINES FROM $\gamma$ -NITROPHENYL- AND $\gamma$ -NITROBENZYL PYRIDINES

Riga KHIMIYA GETEROTSIKLICHESKIKH SOYEDINENIY in Russian No 3, Mar 79  
pp 384-389 manuscript received 4 Apr 78

PROSTAKOV, N. S., KRAPIVKO, A. P., SOLDATENKOV, A. T., SAVINA, A. A. and ROMERO, I., Friendship University imeni P. Lumumba, Moscow

[Abstract] An investigation was made of the influence that an electron acceptor nitro group in substituted quaternary pyridinium salts has on the formation of ylids and their stability, and on the direction of deprotonation of these labile systems under conditions of ylid formation. Quaternary salts including two growth regulators are synthesized from 2,5-dimethyl-4-p-nitrophenyl-, [m-nitro-p-tolyl]-, [p-nitrobenzyl]-, [o,p-dinitrobenzyl]- and [benzyl]pyridines and bromoacetophenone, benzyl bromide, and p-nitro-bromoacetophenone. An investigation was made of potash treatment of bromides of N-phenacyl(p-nitrophenacyl-, benzyl)-2,5-dimethyl-4-nitrophenyl(nitro-benzyl, benzyl)pyridinium. Stable pyridinium ylids are produced in the case of  $\gamma$ -phenylpyridines that contain the nitro group in the benzene ring, and also in the case of  $\gamma$ -benzylpyridines with N-nitro substituted phenacyl. It is shown that electron acceptor substituents have a stabilizing effect on the ylids. Under these conditions,  $\gamma$ -nitrobenzyl derivatives are converted to substituted 1,4-dihydropyridines, one of which, 2,5-dimethyl-1-benzyl-4(p-nitrobenzylidene)-1,4-dihydropyridine, shows herbicidal properties. The Tschitschibabin reaction was used to convert the pyridinium salts to a new group of indolizines containing p-nitrophenyl (p-nitrobenzyl) substituents in position 2 or 7. References 7: 4 Russian, 3 Western.

[78-6610]

## USING SODIUM TRICHLOROACETATE AGAINST QUACK GRASS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 3(185), 1979  
pp 49-50

KABYSH, V. A., Candidate of Agricultural Sciences, KISHENKOV, F. G. and  
SINYUKOV, V. P., Candidate of Agricultural Sciences, Moscow Agricultural  
Academy imeni T. A. Timiryazev

[Abstract] The paper gives the results of using sodium TCA to kill quack grass. The tests were done on a field where the raw mass of quack grass rhizomes was 44.8 centners per hectare, and running length was 97.6 m per sq. m. This section was treated with 20 kg/ha of sodium TCA on 9 May 1976, after which it was cultivated. However, the damp and cold weather prevented absorption by the root system, and the easily soluble herbicide was rapidly washed into the lower layers of the soil. Test plants grown on treated soil taken from different depths showed reduced height and mass as compared with the control. Within a month after application of the herbicide, no traces were left in the surface layers. Precipitation during this period was 150.7 mm. Digging confirmed low effectiveness of sodium TCA in a single application: the wet mass of the rhizomes was reduced by only 19.1 centners per hectare, and 59.1% of the rhizomes were killed. Spraying was done again on 24 September 1976. Digging on 22 June 1977 showed that the double application had been effective: the wet mass of rhizomes had been reduced by a factor of 32, and the dry mass was done by a factor of 55. The weed rhizomes were 98.2% dead (by dry mass).

[68-6610]

## EFFECTIVENESS OF MIXTURES AND COMBINATIONS OF HERBICIDES ON MAIZE FIELDS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 3(185), 1979  
pp 43-48

FISYUNOV, A. V., Doctor of Agricultural Sciences, and LITVINOV, A. S.,  
Poltava Agricultural Institute

[Abstract] Experiments were done on using mixtures and combinations of herbicides to check weeds in cornfields on the Prokhorovskiy Sovkhoz of Belgorodskaya Oblast. The herbicides were applied with consideration of

water solubility and peculiarities of action against certain weeds. In calculating the economic effectiveness of herbicide application, consideration was taken of the machine operator's salary, cost of preparing the working solutions, fuel, lubricant, fertilizers, transportation, depreciation and upkeep of equipment. The greatest economic effectiveness (6.28 rubles of profit per ruble of expenditure) was realized when the soil was treated with polytriazine (1.5 kg/ha) in a mixture with prometrin (2 kg/ha). In mixed weeds, and when annual monocotyledonous weeds predominate on cornfields, polytriazine and prometrin are highly effective herbicides. The optimum dose of polytriazine for controlling annual weeds is 3 kg/ha. When annual dicotyledonous weeds predominate, the most effective mixture is polytriazine with linuron (1.5 + 2 kg/ha) applied against a background of mineral fertilizer. Another effective treatment is application of polytriazine (2 kg/ha) after the fall plowing combined with spraying with krotilin (0.3 kg/ha) when the corn is in the stage of 3-5 leaves.

[68-6610]

USSR

UDC 632.952:634.11

#### SYSTEMIC FUNGICIDES AGAINST APPLE SCAB AND POWDERY MILDEW OF APPLE TREES

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 3(185), 1979 pp 39-42

GALETENKO, S. M., Candidate of Biological Sciences, Crimean Toxicological Laboratory of the All-Union Institute of Plant Protection, and YUNEV, B. S., Pobeda Sovkhoz, Nizhnegorodskiy Rayon, Krymskaya Oblast

[Abstract] The results of tests done in 1973-1977 to find effective fungicides against apple scab *Fusicladium dendriticum* Fuck. and powdery mildew *Oidium farinosum* Cook. in Crimean apple orchards. The pesticides studied were benomil, fundazol, BMK, uzgen, olgin, topsin NF-35, topsin-M, bavestin and derozal. The standards were zineb and colloidal sulfur. All fungicides were found to be effective against powdery mildew, the best being bavestin and derozal. The best results against apple scab were shown by benomil, uzgen and olgin. The topsin fungicides were ineffective against apple scab. References 4 (Russian).

[68-6610]

## PENETRABILITY OF THE CUTICULAE OF HOUSEFLIES THAT ARE RESISTANT AND SUSCEPTIBLE TO CHLOROPHOS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 3(185), 1979 pp 36-39

PEREGUDA, T. A., Candidate of Biological Sciences and ZOLOTAREV, YE. KH., Doctor of Biological Sciences, Moscow State University

[Abstract] Isotopic analysis was used to study the penetrability of cuticulae of two strains of houseflies: a chlorophos-resistant strain ( $LD_{50}$  70  $\mu$ g per female) and a chlorophos-susceptible strain ( $LD_{50}$  0.5  $\mu$ g per female). The chlorophos was tagged with  $^{32}P$ , and  $^{14}C$  was used as the tracer in amyl alcohol, isovaleric acid and propionic acid. The material washed from the cuticulae of the treated insects was analyzed by thin-layer chromatography. It was found that the penetration of chlorophos through the cuticula was lower for resistant flies than for susceptible flies. In a study of the reasons for slower penetration in the case of resistant insects, it was found that the epicuticular components of resistant flies contain a higher concentration of saturated fatty acids and a lower concentration of unsaturated fatty acids than those of susceptible insects. Figures 3; references 17: 4 Russian, 13 Western.

[68-6610]

## AFTEREFFECT OF MALATHION ON ACRIDIDAE

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 3(185), 1979 pp 35-36

KURDYUKOV, V. V. and STAROSTIN, S. P., All-Union Institute of Plant Protection

[Abstract] Studies were done to determine the effect that malathion treatment of acridid larvae has on the insect population in the following year. Spraying was done from airplanes at a height of 5 m, wind speed was 1.8-3.3 m/s. The application of 40% malathion was 2 liters per hectare in a width of 45-60 m. The application was repeated three times on sections with an area of 200 hectares in the Sary-Agachskiy Rayon of Chirkentskaya Oblast. Application in a 45 m swath reduced the population

of various species of acridid larvae by 90.9-95.2%. Application in a 60 m swath killed 83.3% of the larvae. A year after application, the population of acrididae was on the level observed the previous year the day after spraying. The results show pronounced inhibitive action of malathion on surviving larvae. References 11: 9 Russian, 2 Western.

[68-6610]

USSR

UDC 632.934:633.17

#### COMBINED TREATMENT OF BARLEY AGAINST RHYNCHOSPORIUM DISEASE AND LODGING

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 2(184), 1979 pp 31-34

DRAPATYY, N. A., Rovno Experimental Agricultural Station

[Abstract] A report on prophylactic treatment of barley fields with a combination of kuprozan, amine salt of 2,4-D and chlorocholine chloride to prevent rhynchosporium disease and lodging, while simultaneously controlling weeds. The studies were done in 1975-1977 at the Rovno Experimental Station in low-humus black earth on the El'gin variety of barley. Spraying was done with 90% wettable powder of copper oxychloride, kuprozan containing 65% copper oxychloride and 15% zineb, a 40% concentrate of amine salt of 2,4-D and a 60% aqueous solution of chlorocholine chloride. The expenditure of working liquid was 400 liters per hectare. Four applications were used. The results showed that this treatment not only prevents rhynchosporium disease and lodging while controlling weeds, but also has a stimulating effect on growth of barley, and improves the brewing properties of the grain. References 6 (Russian).

[69-6610]

## TOXICITY OF PYRETHROIDS FOR COTTON LEAFWORMS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 2(184), 1979  
pp 34-36

SUKHORUCHENKO, G. I., Candidate of Agricultural Sciences, SMIRNOVA, A. A.,  
Candidate of Agricultural Sciences, and KAPITAN, A. I., All-Union Institute  
of Plant Protection

[Abstract] The effectiveness of the new NEDC pyrethroids against cotton  
leafworms that are resistant to organochlorine insecticides was studied.  
The experiments were done on the Karl Marx Kolkhoz in Parkharskiy Rayon  
of the Tadzhik SSR. Six non-Soviet pyrethroids were used: permethrin and  
sipermetrin (Shell), sumitsidin (Sumitoma Chemical), izatrin and detsis  
(Prosida) and pareksan (Khëkhst). The toxicity, duration of toxic action  
and technical effectiveness of the chemicals were evaluated. It was found  
that permethrin, sipermetrin and sumitsidin combine high initial toxicity  
for cotton leafworms with fairly prolonged protective action under field  
conditions. These agents were as effective as the standard (Sevin) over  
a 15-day period, even though they were used in much smaller amounts. In  
addition to their other positive features, these compounds have low  
environmental impact. They have a good outlook for use in Soviet cotton  
growing. References 11: 3 Russian, 8 Western.

[69-6610]

EFFECTIVENESS OF SYSTEMATIC APPLICATION OF HERBICIDES AGAINST A HIGH-  
NUTRIMENT BACKGROUND UNDER CONDITIONS OF INTENSIVE CULTIVATION WITH  
SPECIALIZATION IN GRAIN CROPS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 2(184), 1979  
pp 36-40

SMIRNOV, B. A., Candidate of Agricultural Sciences, BAZDYREV, G. I.,  
Candidate of Agricultural Sciences, ZOTOV, L. I., SAFONOVA, L. I. and  
AKSENOV, A. A., Moscow Agricultural Academy imeni K. A. Timiryazev

[Abstract] A method was developed for controlling weeds, especially  
annuals, in fields permanently sown to winter and spring grain crops on  
the basis of recommended herbicides to bring the weed population down

to the level of crop rotation methods. The proposed technique involves systematic application of herbicides in combination with a high-nutrient background to improve conditions of growth and development of the crop to shade the weeds and inhibit detoxication of herbicides penetrating into the weeds. Three-factor experiments were done to study different conditions of crop cultivation, nutrient backgrounds, and herbicides. It was found that when NPK fertilizer and manure are used to increase crop growth, detoxication of 2,4-D and 2M-4Kh herbicides is minimized, which is most noticeable in the aftereffect of the herbicides, i.e., in low weed population at the very beginning of the following crop vegetation period. It was also found that 2,4-D can be effective against a high-nutrient background in crop rotation as well as on plots permanently sown to grain crops. References 11: 9 Russian, 1 Hungarian, 1 Western.

[69-6610]

USSR

UDC 632.954:635.21

#### USING HERBAN FOR POTATO GROWING

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 2(184), 1979 pp 40-43

PROTASOV, N. I., Candidate of Agricultural Sciences, BURSKIY, YE. N., Belorussian Agricultural Academy, BURYY, V. S., Candidate of Medical Sciences, GOSHIKA, A. T. and POPOVICH, N. A., All-Union Scientific Research Institute of Hygiene and Toxicology, Pesticides, Polymers and Plastics

[Abstract] Experiments were done on the use of Herban in potato growing on the Kalinin Kolkhoz, Goretskiy Rayon, Mogilevskaya Oblast. The herbicide was applied in doses of 3-5 kg/ha two or three days before the potato sprouts appeared. Residual amounts of Herban in the potato greens and tubers and in the soil were determined by thin-layer chromatography. It was found that this technique of pre-emergence herbicidal treatment is effective in weed control, has no detrimental effect on the structure of the potato crop, and does not lower the quality of the tuber. The use of the herbicide did not influence the content of nitrogen, phosphorus and potassium in the potato plant, and there was no change in the content of calcium, magnesium, and vitamins C, B<sub>1</sub> and B<sub>2</sub> in the tubers. The content of residual amounts of Herban in young potatoes was within the standard of 0.1 mg/kg, and mature potatoes showed no traces of the herbicide. References 6 (Russian).

[69-6610]

SELECTION OF THE OPTIMUM CRYSTALLIZATION REGIMES OF THE  $\gamma$ -ISOMER OF HEXACHLORANE IN THE PREPARATION OF INSECTICIDES

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, 1979 pp 297-299

MIKHIN, YE. V., GAVRILOV, YU. A., PEKLER, A. M., CHAGAYEVA, T. S. and KRIVOZUBOV, O. V.

[Abstract] A systematic study was carried out on the factors which influence the title process. The first series of experiments was performed using a static batch crystallization unit. The solubility increases from about 4 mole % dissolved in methanol at 6°C to 17 mole % at 48°C. When water (4.1%) was added to the methanol, the solubilities decrease to 4 and 12 mole % respectively. When the solution is stirred at 300 rpm, the average diameter of the crystal during the first two hours (0.5 - 0.7 mm) was over twice the size of the same system after three hours (0.25 mm) or of crystals stirred at 120 rpm or less for the entire time (about 0.3 mm). The purity of the crystals also decreases with increasing agitation. This indicates that the mechanism of the accumulation is rather complex. For example, the principal impurity, the  $\alpha$ -isomer of hexachlorane, at the high crystallization rates which are associated with strong agitation of the solution, does not accumulate in the crystal structure during the initial period of crystallization due to the efficient removal of the mother liquor from the crystal surface and also to the two different rates of diffusion of the  $\alpha$ - and  $\beta$ -isomers in the surface film. The second series of experiments was carried out in a crystallization chamber using a continuously circulating suspension of the crystals. The quality of the product did not change; however, the average size of the crystals was much smaller (about 0.05mm). The recirculating system is much easier to use. Figures 5; references 5 (Russian).

## RESISTANCE OF THE HOUSE FLY TO GARDON

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979 pp 52-55

ROSLAVTSEVA, Doctor of Biological Sciences, IVANOVA, G. B., Candidate of Biological Sciences, SPININA, T. A., AGASHKOVA, T. M. and SKVORTSOVA, I. V., All-Union Scientific Research Institute of Chemical Means of Plant Protection

[Abstract] Gardon [vinylphosphate, tetrachlorvinphos 0,0-dimethyl-2-chloro-1-(2,4,5-trichlorophenyl) vinylphosphate] is an insecticide which

exhibits low toxicity for warm-blooded animals. Its properties have been described earlier (Moscow, 1973). The present study examined the development of resistance to gardon, under laboratory conditions of races of adult indoor flies (of normal resistance) and by races resistant to chlorophos. It is noted that flies, controlled by chlorophos in various areas of the USSR, had rapidly developed resistance to that agent. The flies became resistant after 5 generations had been exposed to it and in the 15th generation resistance was considerable. Flies resistant to chlorophos developed high resistance to gardon in five generations. Thus, gardon is an ineffective replacement for chlorophos. Tests were run with various insecticides to see which might be substituted for gardon. Several insecticides are recommended as suitable substitutes (viz., neopinamin, orten, dioxacarb, etc.); those which cannot be substituted for gardon include chlorophos (and, also carbophos, cumafos, cidal, etc.). Since transmission of resistance from imago to the preimaginal phase does not occur, gardon can be used as an ovo and larvicide even where high resistance is exhibited by the adult flies. References 8: 4 Russian, 4 Western.

[70-8586]

USSR

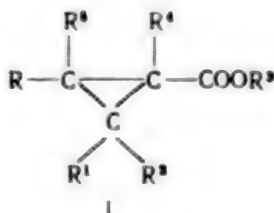
UDC 635.95.024

# PHYSIOLOGICAL ACTIVITY OF PYRETHROIDS AS A FUNCTION OF THEIR STRUCTURE

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1 1979 pp 46-52

PROMONENKOV, V. K., Doctor of Chemical Sciences and KOROTKOVA, O. A., All-Union Scientific Research Institute of Chemicals Used for Plant Protection

[Abstract] This article is a review of non-Soviet literature on pesticide derivatives of cyclopropanecarboxylic acids (CPCA):



The article examines several derivatives of I where  $\text{R} = (\text{CH}_3)_2\text{C} = \text{CH}$ ;  $\text{R}^1 = \text{R}^2 = \text{CH}_3$ ;  $\text{R}^3 = \text{R}^4 = \text{R}^5 = \text{H}$ , (and a number of related compounds) to

identify the effect of structure on physiological activity. The toxicity of 5-benzylfuryl-3-methyl esters (CPCA) was tested against the house fly *Musca Domestica*. It is cautioned that toxic doses of pyrethroids for flies will be different than those for other insects (e.g., mosquitoes). The relative toxicity of the CPCA esters (40 in all) for the fly are tabulated. An unsaturated radical in the R<sup>2</sup> position is, apparently, quite necessary for an active agent; the role of cis, trans isomers is also great. Attention is given to the role of the acid portion and of the alcohol portion of the pyrethroid series in setting the activity of these agents, and to mechanism of their action--which is, essentially, unknown. References 60: 1 Russian, 59 Western.

[70-8586]

USSR

#### RESISTANCE OF HARMFUL ARTHROPODS TO INSECTOACARICIDES

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979  
pp 33-34

ROSLAVTSEVA, S. A., Doctor of Biological Sciences

[Abstract] At the Fourth International Congress on the Chemistry of Pesticides, information was presented on the mechanism of action and biochemistry of new insectoacaricides, on resistance to organophosphorous compounds, monocrotophos and its toxic potentiation with PPB, piperonyl-butoxide and on DDT resistance. Roslavitseva and T. A. Spirina (USSR) co-authored a report on the esterase mechanisms of resistance to orten and gardon by the house fly and ticks. Roslavitseva calls attention to work at the All-Union Institute of Plant Protection and the Institute of Evolutionary Physiology and Biochemistry, USSR Academy of Sciences on purified cholinesterase and the enzyme mechanism of resistance. No references.

[70-8586]

## FOURTH INTERNATIONAL CONGRESS ON THE CHEMISTRY OF PESTICIDES. HERBICIDES AND PLANT GROWTH REGULATORS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 1, 1979 pp 31-33

BASKAKOV, YU. A., Doctor of Chemical Sciences

[Abstract] This is a detailed report on what was presented at the Congress about current foreign work on herbicides and plant growth regulators. Major stress was placed on: i) optimization of exploratory synthesis, based on activity as a function of structure, making use of the QSAR-model and the Range-1 and Range-2 programs of optimization of search; ii) analogous synthesis based on models--natural compounds with regulator function, and reports by Schraiber (DDR), Bellus and Fischer (Switzerland), Tamura (Japan), Steffens, et al. (USA), Balicka, et al. (Poland), Hansen et al.; Draber and Fedtke (BRD); Van Ash (France); Vnis (GB); Foy and Gang; Crisp and Luk (US); Hiyakutake and Ishizuka (Japan); Stephenson (Canada); Janos (Hungary); and by the Soviet author Yu. V. Kruglov who spoke on the effect of herbicide mechanisms on symbiosis of tuber bacteria and legumes. Two lists were prepared: i) herbicides--from the firms Saniko, Nippon-Soda, Hoechst, Mitsubishi, Ciba-Geigy (three citations)--and their action; ii) plant growth regulators--from the firms 3M, Lonza and Harris. The latter is an Australian firm, interested in inhibitors. No references.

[70-8586]

## RESIDUES OF DAKTAL AND ALITSEP IN SOIL AND ONION PLANTS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 27 No 4(186), 1979 pp 47-49

PARSHUTIN, S. M., Candidate of Agricultural Sciences, KHRIPKO, T. V., Candidate of Agricultural Sciences, RAKHMANOV, M. R. and ZABALUYEV, I. T., Candidate of Agricultural Sciences, All-Union Scientific Research Institute of Chemical Means of Plant Protection

[Abstract] Studies were made to determine the residual soil content of daktal (dimethyl-2,3,5,6-tetrachloroterephthalate) and alitsep containing

25% pyrazon (1-phenyl-4-amino-5-chloropyridazon-6) and 20% ByPC [butyn-1-yl-3-N-(3-chlorophenyl)-carbamate], and also to determine the periods of detoxification of these herbicides in plants by periodic sampling and analysis of soil and plant specimens taken from treated fields. The soil was sprayed with daktal immediately after planting onions, and with alitsep in the eyelet phase of the onion plants. Soil specimens were taken by coring at depths of 0-10, 10-20 and 20-30 cm within 10, 20, 30, 60, 90 and 120 days after application of the herbicides. Plant specimens (onions and weeds) were taken at the same time. The herbicide content in the onion bulbs was determined before harvesting. Determination of herbicides was done by thin-layer chromatography with a sensitivity of 0.5 µg for daktal, and 0.1 mg/kg for pyrazon in alitsep. It was found that treated soil contains daktal and alitsep for 90 days. The onions harvested as produce contained no traces of the herbicides. Neither herbicide penetrated into the lower layers of the soil, which eliminates the danger of contamination of ground water. References 12: 11 Russian, 1 Western.

[82-6610]

USSR

CATALYTIC CRACKING UNIT OF NOVO-YAROSLAV OIL REFINERY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Aug 79 p 3



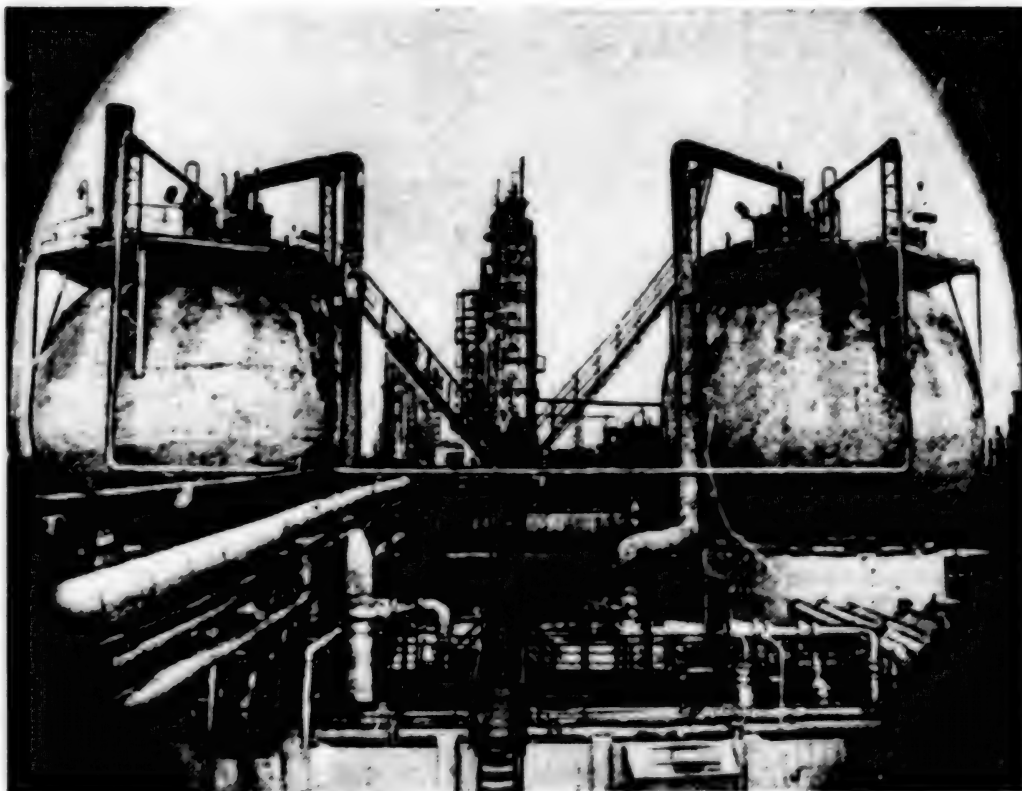
[Text] One of the sections of the catalytic reforming unit of the Novo-Yaroslav Oil Refinery imeni All-Union Lenin Young Communist League. A group of workers were recently praised for exceeding one thousand tons of production over the plan.

CSO: 1841-P

USSR

SHOP NO 7 OF THE NOVO-BAKU OIL REFINERY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Jul 79 p 3



[Text] Personnel of the Novo-Baku Order of the October Revolution Oil Refinery imeni Vladimir Il'ich have successfully fulfilled the plan for the first six months. Since the beginning of the year over 100,000 rubles worth of production in excess of the plan have been carried out. The photo shows one of the sections of Shop No 7.

CSO: 1841-P

USSR

UDC 614.777:632.954.2

ESTABLISHMENT OF MAXIMUM PERMISSIBLE CONCENTRATIONS OF METURIN, PHENYL-METHYLUREA AND PHENYLHYDROXYLAMINE IN RESERVOIR WATER

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 pp 68-70 manuscript received 6 Jun 78

GORYAINOVA, A. N. and RUBINSKIY, N. D., Candidates of Medical Sciences [CMS], MNUSHKINA, E. A. and SHCHERBAN, N. G., CMS

[Abstract] Meturin (M), phenylmethylurea (PMU) and phenylhydroxylamine (PHA) were shown by assay, spectrophotometry and interferometry, to be highly persistent in water; M and PHA lend an undesirable odor and inhibit growth of life forms. PMU is less obnoxious. The products do not have a cumulative action. Based on animal tests--effect on blood constituents, reproduction, immunological reactivity, oxidation-reduction processes--the maximum permissible levels were set up for M (1.0 mg/l), PHA (0.1 mg/l) and PMU (5 mg/l) of reservoir water. Toxicity of the agents in mice, rats and rabbits is tabulated. No references.

USSR

UDC 614.72:613.155.3

DIFFUSION DOSING OF KNOWN CONCENTRATIONS OF TOXIC SUBSTANCES IN AN AIR CHAMBER

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 pp 41-46 manuscript received 31 Aug 78

DMITRIYEV, M. T., Doctor of Chemical Sciences and MISHCHIKHIN, V. A., Institute of General and Communal Hygiene imeni A. N. Sytin, USSR Academy of Medical Sciences, Moscow; Fourth Main Administration of the USSR Ministry of Health, Moscow

[Abstract] A simple device is described which is suitable for delivery of known, desired concentrations of poisonous substances into an air chamber; such a device would deliver a known amount of toxic substance into the air and serve to create standards for the construction of gas analyzers, to calibrate gas chromatographs and to create conditions for hygienic assay--e.g., adherence to maximum permissible levels of toxic materials. The device pictured is a U-tube capillary of specific diameter (e.g., 1 mm) one end of which is the extension of a burette-type, stopcock-feed of the toxic substance into the capillary; the other end is fitted with a scale for measurement of diffused material. The capillary is

placed within a water ultrathermostat. The capillary was calibrated by weight (Hg), for volume. Dosing of a chamber was based on diffusion of vapors of a toxic substance from the capillary. Relation of rates of vaporization (of ether, benzene) on levels of liquid in the capillary were graphed. Diffusion dosing was found to provide steady, set concentrations with a high degree of accuracy. Figures 3; references 13: 11 Russian, 2 Western.

USSR

UDC 628.162.82:613.32

#### TRANSFORMATION OF TOXIC CHEMICALS IN THE PROCESS OF WATER OZONIZATION

Moscow GIGIYENA I SANITARIYA in Russian No 3, Mar 79 pp 15-18 manuscript received 14 Aug 78

SHTANNIKOV, YE. V., STEPANOVA, N. YU. and PODZEMEL'NIKOV, Department of General Hygiene, Saratov Medical Institute

[Abstract] Water contaminated with 2.3 and 5 times the maximum permissible levels of organochloro and organophosphorus pesticides DDT, HCCH, metafos and chlorofos was ozonized under laboratory conditions in an LGO-15 apparatus for periods of 20 min to 2 hr. Using thin-layer chromatography it was shown that this process destroyed 70% of the organochloro and 90% of the organophosphorus compounds. The relationship between degree of destruction, changes in the organoleptic properties of the water and the toxicity of the pesticides was examined. Destruction decreased the odors of the organophosphorus-contaminated water but increased that of the DDT-water. Ozonization did not have a substantial toxicity-lowering effect. Transformation products possessed cardiotoxic, anticholinesterase action and adversely affected the nervous system in test animals (rats). Data on toxicity of transformation products and on altered organoleptic properties are tabulated. References 1 (Russian).

USSR

UDC 613.632:678.044.46

ON THE QUESTION OF TOXICITY OF EXTRACTS FROM RUBBER BASED ON DIFFERENT STOCKS CONTAINING THIURAM

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 79 pp 82-83 manuscript received 10 Feb 78

SHUMSKAYA, N. I., MEL'NIKOVA, V. V., CHIKISHEV, YU. G. and TARADAY, YE. P., Scientific Research Institute of Rubber and Latex Items, Moscow

[Abstract] Comparison studies were made on the toxicity of extracts from four grades of rubber with different types of stock and filler containing the same amount of accelerator. Two grades of rubber (IR-34A and IR-34P) were based on natural smoked sheets, and the other two (IR-34L and IR-34N) were based on synthetic latex SKN-26. Carbon was used as the filler in the first two grades, and chalk was used in the others. The other ingredients, zinc oxide, mineral oil, stearin and sulfur, were the same in all four grades. Thin-layer chromatography was used to determine thiuram and Zimate in distilled water extracts. The total amount of these substances migrating into the water extracts was found to be about 1 mg/l regardless of the type of rubber stock and filler. Toxicity experiments were done on white rats with daily injections of the water extracts in an amount of 20 ml/kg. The results show that extracts from rubber based on SKN-26 stock are more toxic than those based on natural latex with the same thiuram and Zimate content. References 5 (Russian).

[77-6610]

USSR

UDC 612.61.014.46:[613.298:666.293.5]-087

CYTOLOGICAL STUDIES OF GONADOTOXIC ACTION OF A COMPLEX OF SUBSTANCES THAT MIGRATE FROM CULINARY ENAMELWARE

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 79 pp 19-24 manuscript received 12 Jul 78

IVANOV, YU. V. and DOBROSLAVSKAYA, T. L., Moscow Scientific Research Institute of Hygiene imeni F. F. Erisman

[Abstract] An investigation was made of the possible gonadotoxic effect of a number of substances that migrate from enamel cookware into infusions. Utensils were studied that are made from new grades of titanium enamels.

The research was done to develop an adequate quantitative method of analyzing disorders of spermatogenesis. Physiological, morphological and biochemical methods are extensively used in evaluating the gonadotoxic action of various chemicals. In the morphological method of studying the testes, use was made of both the qualitative pattern of changes in the state of the gland, and a semiquantitative assessment of the differentiated count of different types of cells of the spermatogenic epithelium on microscopic sections of the seminiferous tubules. This is a tedious process requiring identification of stages of spermatogenesis and correlation of observed shifts in the gland with a control with respect to selected stages. The authors propose a method of cytomorphological examination of stained testicle homogenates that is a rapid analysis technique. The results are expressed in absolute figures for major cell types in the spermatogenic epithelium, enabling clear differentiation of observed shifts. References 5: 3 Russian, 2 Western.

[77-6610]

USSR

UDC 615.285.7.015.4:612.617.015.1

INFLUENCE THAT THE ORGANOCHLORINE PESTICIDES KELTHANE AND LINDANE HAVE ON THE ACTIVITY OF ENZYMES AND ON THEIR ISOENZYMES IN RAT TESTES

Moscow GICHIYENA I SANITARIYA in Russian No 2, Feb 79 pp 16-19 manuscript received 11 May 78

BOGATYKH, T. A., Candidate of Biological Sciences, ORLOVA, N. V., Candidate of Biological Sciences and AKINCHEVA, M. YA., Institute of Nutrition, Academy of Medical Sciences USSR, Moscow

[Abstract] An investigation was made of the effect of small amounts of Kelthane and lindane on the activity of some enzymes and their metabolic isoenzymes--lactate dehydrogenase, succinate dehydrogenase and glucose-6-phosphate dehydrogenase--in the testes. The pesticides were administered to half-grown male rats perorally with sunflower oil in doses of 1/100 and 1/1000 of the LD<sub>50</sub> for a 9-month period. A study of the gonads of the rats given the larger dose of the chemicals showed similar changes. Within three months the activity of succinate dehydrogenase has begun to drop, and by six months it has fallen by 15% for Kelthane, and by 10% for lindane. The isoenzyme spectra reveal shifts in the activity of lactate dehydrogenase and glucose-6-phosphate dehydrogenase as well. The smaller doses of these pesticides (1/1000 LD<sub>50</sub>) were found to be below the threshold of toxic action on male rat gonads. References 9: 5 Russian, 4 Western.

[77-6610]

USSR

UDC 678.743.22:543.874

FIRE RETARDANTS BASED ON PLASTICIZED PVC AS SHIPBUILDING MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 4, 79 pp 47-48 manuscript received 12 Oct 77

GLAZKOVA, N. V., ARKHIPOVA, L. I., SAVEL'YEV, A. P. and PEROV, M. D.

[Abstract] PVC (polyvinyl chloride) materials used in shipbuilding should not only be fire-retardant but also frost-, oil-, and gasoline-resistant; these latter qualities depend on the amount and type of plasticizing agent used. In this connection, the effect of various plasticizing agents (PA) on PVC C-70 compositions stabilized with tribasic lead sulfite, dibasic lead stearate, and calcium stearate was investigated. The tests for resistance to oil and gasoline were based on change in mass of specimens following exposure in corresponding media. Combustibility was determined by the calorimetric method, and tensile strength and frost resistance were determined by standard procedures. No single plasticizing agent in itself was found to assure the desired combination of properties. However, the combined use of the polyester PA (polydiethyleneglycoldibutyladipinate) and the sebacinate PA dioctylsebacinate (in amounts and proportions contingent on the rigidity requirements posed to particular shipbuilding materials) assured the optimal combination of the desired properties with the exception of noncombustibility. To improve the noncombustibility of the resulting materials, they were treated with the traditional fire-retardant additive--antimony trioxide. The resulting compositions are superior to currently produced shipbuilding materials. They have passed prolonged operating trials as decorative and finishing materials on ships. References 4 (Russian).

[93-1386]

USSR

UDC 541.66

FIRE RESISTANCE OF ETHYLENE  $\alpha$ -BUTYLENE COPOLYMER AND OF THE RESULTING FIREPROOF COMPOSITE MATERIAL

Baku AZERBAJDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 5, 1979 pp 74-77

ALIYEVA, R. A., All-Union Scientific Research Institute of Olefins

[Abstract] In view of the need for adequate fireproof cable insulating materials, the fire resistance of ethylene  $\alpha$ -butylene copolymer (CEB)

and of the resulting composite material was investigated. The composite material (CM) was obtained by rolling CEB treated with such antipyrenes as antimony trioxide and chlorinated paraffin as well as with the stabilizing agent WSP nanox and with the anti-cracking agent ethylene-propylene rubber. Fire resistance of both CEB and CM (pressed specimens measuring 120x10x4 mm) was determined as a function of their melting points and of the flow index of the melt  $J_p$ . Given a fire resistance index (FRI) of 1.0 for CEB with the melting point 130°C, the effect of various additives in the CM was investigated. The CM with optimal FRI = 2.0 is obtained when CEB is treated with 10%  $Sb_2O_3$ , 10% chlorinated paraffin and 0.25% WSP nanox, and as such represents improved cable insulation. Figure 1; references 6: 4 Russian, 2 Western.

USSR

UDC 541(64+126)

#### INFLUENCE OF THE THERMAL PROPERTIES OF POLYMERS ON THE RATE OF PROPAGATION OF A FLAME OVER THEIR SURFACE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 21 No 4, Apr 79  
pp 825-829 manuscript received 21 Mar 78

LALAYAN, V. M., KHALTURINSKIY, N. A., BERLIN, A. I., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Development of methods of inhibition of combustion and protection of polymer materials requires clarification of the basic regularities involved in the process of combustion. A study is presented of the influence of the properties of a polymer material and of external conditions on the flame propagation rate. Experiments were conducted in a stream of oxidant, a mixture of nitrogen and oxygen, in a quartz tube. The speed and concentration of oxygen were measured and fixed. Polymers with various physical and chemical properties were selected to determine the influence of the characteristics of the polymer material on the flame propagation rate. An empirical equation was derived for the flame propagation rate over the surface of a polymer as a function of the concentration of oxygen in the stream of oxidant, relating the experimentally observed coefficients to the physical properties of the polymers. The introduction of inert fillers which change the thermophysical properties of the polymers can significantly change the flame propagation rate. Special experiments showed that the presence of heterogeneities in the polymer material comparable to the dimensions of the heated layer can result in a variation of propagation rate with oxygen concentration. Figures 4; references 8: 5 Russian, 3 Western.

USSR

UDC 678.674(088.8)

# SYNTHESIS AND STUDY OF POLYESTERS OF LOW INFLAMMABILITY

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 240 No 4, 1979 pp 882-886  
submitted 5 Jan 79

MASLOSH, V. Z., POPENKO, G. V., IZMEYEV, A. A. and Academician KORSHAK, V. V., Institute of Natural Sciences Buryat Branch of the USSR Academy of Sciences, Siberian Section, Ulan Ude

[Abstract] The use of tetrabromophthalate anhydride and bifunctional dyes of the anthraquinone series in the polycondensation reaction makes possible the synthesis of inflammable polyesters suitable for producing non-combustible polyurethane foams. Polyurethane foams produced from the inflammable polyesters possess high fire-resistance indicators and good physico-mechanical properties. Introduction of the dye component into the oligoester not only increases the fire-resistance of polyurethane foams but also reduces the quantity of bromine containing oligomer in the composition. The structural formula of the inflammable polyester synthesized is presented. Figure 1; references 5.

USSR

UDC 678.742.2:678.029.65

# IMPROVEMENTS IN FIREPROOF QUALITY OF HIGH-DENSITY POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 4, 79 p 58

GUSEYNOV, M. M., KYAZIMOVA, T. G., BABAYEV, R. S. and MAMEDOVA, E. S.

[Abstract] The effect of a polyhalogen-containing compound--the 1,2,3,4-tetrachloro-7,7-dimethoxy-dicyclo(2,2,1)-heptene-2-methyl ester of trichloroacetic acid--on the fireproof quality and physico-mechanical properties of high-density polyethylene (HDP) was investigated. It was established that this antipyren makes HDP nonflammable only when used in a combination with  $Sb_2O_3$ . It takes 2.5 min to initiate the combustion of the optimal composition and that combustion instantaneously ceases upon withdrawal of specimen from flame. Treatment with the above antipyren and  $Sb_2O_3$  was not found to adversely affect the melting index, tensile strength, elongation at rupture, dielectric loss tangent, and permittivity of HDP. The proposed polychlorodicyclic ester surpasses in effectiveness the KhP-600 industrially manufactured antipyren.

[93-1386]

USSR

UDC 541(183:12+64)

POLYMER SYSTEMS INCLUDING SYNTHETIC POLYELECTROLYTES AND PHYSIOLOGICALLY ACTIVE COMPONENTS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 21 No 4, Apr 79 pp 723-733

SAMSONOV, G. V.

[Abstract] This article is a review of the methods used and results achieved in the study of the intermolecular interaction of physiologically active substances (PAS) with soluble or insoluble polymers, particularly reticular polymers. The studies were performed in order to modify the PAS, stabilize, inhibit, activate them or change the details of their action, or to model biologic polymers and supermolecular structures. Modification of PAS with polyelectrolytes, chromatography of polymers, calculation of constants such as the stability and kinetic constants and the formation of complexes were also studied. It is noted that effective selection of polymer carriers for PAS must be based on the laws of thermodynamics of intermolecular interactions, as well as the kinetic and dynamic specifics of the systems involved. Figures 14; references 21: 16 Russian, 5 Western.

USSR

UDC 678.743.41-278

ANISOTROPIC MEMBRANES BASED ON F-2M

Moscow PLASTICHESKIYE MASSY in Russian No 4, 79 pp 51-52 manuscript received

NACHINKIN, O. I., SHUBINA, T. G., RUBAN, I. G. and STROGANOVA, S. D.

[Abstract] The process of obtaining membranes of F-2M ftorlon [fluorlon] and their properties are described. The films were formed by pouring concentrated solutions of the polymer via a drawplate onto a glass substrate with subsequent submersion into a settling agent, rinsing, and drying. A high degree of porosity is assured by reducing the supersaturation of the polymer solution with respect to equilibrium state. It was found that the unit productivity (permeability) of the membranes increases with decrease of the polymer content of the solution or with increase in operating temperature of solution, while the selectivity of purification varies in the opposite direction. Electronmicroscopic examination showed that F-2M ftorlon membranes represent anisotropic materials with differing

structure of surface layers. The pores are represented by irregularly shaped sinuous channels along which fluid moves by the mechanism of viscous flow owing to pressure drop. The bulk porosity of the membranes is 70-90% depending on the conditions of their production. These membranes are designed to filter out  $\geq 0.2-1.0 \mu$  particles from liquid organic media and solutions of mineral compounds over a broad range of pH values. The service life of these membranes (the time over which their permeability decreases in half) varies from several hours to one month depending on degree of contamination or on the solid-phase content of the fluid being filtered. Figures 2; references 5: 4 Russian, 1 Western.

[93-1386]

USSR

UDC 678.652.003

#### MAIN DEVELOPMENTAL TRENDS OF THE PRODUCTION OF AMINOPLASTICS

Moscow PLASTICHESKIYE MASSY in Russian No 4, 1979 p 45

LEYTMAN, B. V., PANKINA, YE. A., LATYSH, L. G. and SHTOPOROVA, T. I.

[Abstract] Currently Soviet industry manufactures four types of aminoplastics: class A group A<sub>2</sub>, based on carbamide resin; class B group B<sub>1</sub> (melalite), based on melamine-formaldehyde resin, class B group B<sub>1</sub> (arc-resistant compression molded plastics) based on melamine resin, and class A group A<sub>3</sub> (KM-68). In the future the share of melamine and melamine-formaldehyde plastics is expected to increase. At present aminoplastics are produced by the batch method in installations with a unit capacity of 2,500-5,000 tons/year. It has been established that increased pressures and temperatures accelerate the polycondensation of carbamide and formaldehyde; these findings may serve as a basis for developing the continuous method of production of compression-molded carbamide materials. Research is under way to develop a technology for producing benzoguanamine-modified compression-molded carbamide- and melamine-formaldehyde materials (KB and MB aminoplastics), as well as granulated aminoplastics and new types of castings of carbamide and melamine materials. MB aminoplastic surpasses melalite in its water-repellent properties, thus protecting product surface from food stains (tea, coffee, etc.). KB aminoplastic maximally satisfies the tightened requirements of users as regards technological and performance characteristics. The production of granulated aminoplastics is particularly amenable to automation and thus the processing of these plastics can be greatly facilitated; the cost of processing granulated aminoplastics is 346.5 rubles lower per ton.

[93-1386]

## PHOTODECOMPOSITION, STIMULATED BY FREE RADICALS, OF POLYISOBUTYLENE AT 77°K

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245 No 3, 1979 pp 647-649  
manuscript received 20 Nov 78

MEL'NIKOV, M. YA., Moscow State University imeni M. V. Lomonosov

[Abstract] Photochemical reactions of free radicals can result in the effective decomposition of polymers. A study was made of photochemical transformations of alkyl radicals in polyisobutylene during gamma-ray exposure and photolysis sensitized by aromatic compounds at 77°K, and of the contribution of these transformations to processes of decomposition of the polymer. Samples of commercial polyisobutylene were used after being cleaned by repeated deposition from cyclohexane in n-propanol. Hexahydropyrene was used as a sensitizer and was added to the polymer in a quantity of 0.5 percent by weight by dissolving it together with the polymer in cyclohexane. Specimens under vacuum of  $10^{-3}$  torr were exposed to mercury lamps at 77°K. Helium up to a pressure of 100 torr was let in to prevent heating of the samples in some experiments. Light of the required wavelength was separated by standard light filters and a chlorobromide filter, making possible transmission in the  $240 \leq \lambda \leq 270$  nm region. Gamma exposure was produced with a  $^{60}\text{Co}$  source with a dose of up to 1 to 3 Mrad. EPR spectra were recorded with a Varian E-3 radio spectrometer, and UV absorption spectra with a Unicam SP-8000 spectrophotometer. The molecular weight of polyisobutylene specimens were measured with a Shimadzu CPC-21 scattered light photometer. Heptane was employed as a solvent. Measurements were made in the angle range of 0 to 150°C and in the concentration range of  $(0.8 \text{ to } 3) \cdot 10^{-3}$  g/ml. The gaseous products of photolysis were analyzed with an ROMS-1 radio frequency mass spectrometer. Analysis of EPR and UV absorption spectra showed that the effect of light in the absorption band of middle macroradicals in polyisobutylene causes their dissociation, similarly to processes observed previously in low-molecular hydrocarbons. Methyl radicals are formed in polyisobutylene after the effect of light on middle macroradicals. The kinetics of the dark decomposition of these methyl radicals are described fairly well by a double exponential curve. About 25 percent of the methyl radicals are destroyed according to a kinetic law of the first order with a half-life of 13 to 14 min, and the remaining methyl radicals are destroyed according to a first-order law with a half-life of 195 to 200 min. Breaks in the basic polymer chain occurring during the photolysis of radicals are evidenced by the fact that a reduction in molecular weight of the polymer is observed during the effect of light with a wavelength of 240 to 270 nm on middle macroradicals in polyisobutylene at 77°K. The value of the quantum yield for these breaks was found to equal  $(5 \text{ to } 10) \cdot 10^{-6}$ . The phenomenon described here, of the photodecomposition of the basic chain of carbon-chain polymers stimulated by free radicals, is of fundamental importance in understanding the mechanism of the light aging of polymer materials. Figures 4; references 8 (Russian).

WATER PURITY SAFEGUARDED

Moscow IZVESTIYA in Russian 12 Jul 79 p 2

[Article: "Safeguard Reservoir Purity"]

[Text] The USSR Council of Ministers approved the regulation on state supervision of the use and protection of water sources.

The regulation specifies that state supervision of the use and protection of water resources has as its goal ensuring the adherence by all the ministries, departments, enterprises, institutions, organizations and citizens to the established procedure for using water sources, fulfillment of obligations to protect water sources from pollution, blockage and depletion, and for prevention and elimination of their harmful effect, as well as adherence to the rules for calculating the use of water sources and other rules established by the water resource legislation of the USSR and the union republics.

This supervision is carried out by the councils of people's deputies, their executors and administrative organs, as well as by the USSR Ministry of Land Reclamation and Water Resources, the USSR State Committee on Hydrometeorology and Environmental Control, the USSR Ministry of Geology, the USSR Ministry of Health, the USSR Ministry of the Fishing Industry, the USSR Ministry of Agriculture, the Committee for Supervision of Safe Working Practices in Industry and for Mine Supervision at the USSR Council of Ministers and the Administration of the North Sea Route at the Ministry of the Maritime Fleet, in accordance with their jurisdiction.

In the system of the USSR Ministry of Land Reclamation and Water Resources the supervisory functions are carried out by the Main Administration for Water Conservation and the Main Administration for Comprehensive Use of Water Resources of this ministry, by the appropriate main administrations, the administrations of the ministries of Land Reclamation and Water Resources of the union republics, the basin (territorial) administrations (inspectorates) and other water resource control organs.

The USSR Deputy Minister of Land Reclamation and Water Resources, in charge of problems of the use and conservation of water, in accordance with his post, is at the same time the chief state inspector on the regulation of the use and protection of water resources in the USSR.

The regulation determined the functions of the organs entrusted with this supervision, as well as the rights and obligations of the state inspectors in the implementation of these functions.

[86-12151]

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